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The
Geographical Journal.

No. 3. SEPTEMBER, 1908. Vol. XXXII.

BALKAN GEOGRAPHY AND BALKAN RAILWAYS.*

By NOEL BUXTON.

The reason for public attention to the Balkans to-day takes its origin so exclusively in diplomatic events, that I must urgently beg you to remember that the studies of the Geographical Society are purely non-political. To so many of you the very name of the Balkan conjures up the picture of meetings, dispatches, and mobilizing troops, that I must urgently protest: Cannot we for once be interested in the Balkans as a subject for dispassionate inquiry and pure delight in the extraordinary interest of its natural features? I, at all events, am so anxious not to offend that I confine myself strictly to the printed hints furnished for the guidance of speakers in selecting their proper subjects for study. The name of this paper is, therefore, not "Turkey in Europe"—a name which suggests a kind of political Earl's Court, a sort of Venice in London of a contentious character. Its name is "Balkan Geography," for "Balkan" is a purely geographical term. I remember a villager pointing out the way, saying, "Beyond that thick wood it is 'balkan,'" *i.e.* stony hills. Is it not a relief that for once to-night the name may bring to our minds, not a committee, but only this thought: that beyond the thick wood of politics there is a world of Balkan mountains to be enjoyed?

The Balkan peninsula, once the centre of civilization, is now largely a *terra incognita*. Though numberless Europeans constantly travel through it, very few of them leave the railway. It would be absurd to give the route of the traveller, or to speak of exploring expeditions, in a country so near home. Yet, so little are parts of it traversed, that

* Read at the Royal Geographical Society, May 11, 1908. Map, p. 328.

for many districts there are no accurate maps, as the traveller learns to his discomfiture when he has relied on maps to guide him. Although it is only three days away from London, or perhaps *because* of its nearness, the mountains of Africa are more often climbed than those of Albania.

No part of this still unknown land has lately been described at the meetings of the Geographical Society, except the single range of the Rhodope. For this reason, I must attempt to cover an unduly extensive field, and cannot hope to deal with it in more than a hasty manner, unless I run the risk of finding at the end that I have omitted my most interesting observations. But these are what I should most certainly include, and for this reason, I shall do best to hurry quickly to the most curious samples of Balkan geography. A geographical audience will easily fill in the obvious categories into which these samples fall. Thus can I hope best to throw light upon the three fields to which the Geographical Society directs your attention—geographical conditions, their influence on humanity, and their effect on human enterprise.

The Balkan peninsula is the most irregular of the three prongs which Europe throws out into the southern sea. Above all other qualities it is mountainous, but in particular it is a mountain chaos. Joined to Europe by a broad base, it is yet almost divided from Europe by the greatest river of the west. It is a confused extension of both the Alps and the Carpathians. Its ranges run both north to south and west to east. While the Alps become the Pindus, and run a more or less normal course southward into Greece, the Carpathians, apparently unaffected by the geological movements which created their neighbours, turn southwards when they have dipped underneath the Danube, and then, like a snake, wind eastwards again to the Black sea. The two ranges form a ganglion before they part, and then, in the angle between them, the most beautiful range of the peninsula, including the Rilo and the Rhodope, drifts towards the south-east.

Limestone is everywhere, except at the great heights, where granite appears. In these few instances, summits such as Rilo, the peerless Olympus, Musala in the Rhodope, Lubotim or "the Lovely Thorn" in the Shar, probably attain to 9000 feet. But, paradoxically enough, their heights are not yet ascertained.

It would be idle to enlarge further on the mountain formations, when they have been dealt with by Mr. Hogarth. I need only recall to you the brilliant description in his book, 'The Nearer East,' of the country and its effect on the inhabitants.

The rivers are even more capricious. Though the neck of the peninsula is so wide, yet the rain which falls on the Dinaric Alps within a few hours of the Adriatic is shouldered away by the narrow neck of mountains and directed right across the peninsula to the Black sea, so

that though its base is by far wider than that of either Italy or Spain, the Balkan is almost wholly severed from Europe by a line of water. Not content with this irregularity of formation, other rivers make confusion worse confounded by cutting through the ranges which might have been expected to turn the flow of water in an opposite direction. Thus the Isker, which at Sofia appears to be debarred from the Danube by the most definite wall of mountains imaginable, pierces straight through the Old Balkan, as it is called, and flows to the north instead of the east. Quite close by, the Struma, which would appear destined for the Black sea, bores through the Rilo range and makes a most unexpectedly economic route to the Egean. The Drin accomplishes an

A BALKAN LAKE.

even more remarkable feat in severing the whole enormous backbone of the Pindus, and connects, against all possible expectations, the centre of the peninsula with the Adriatic. The great Maritsa, which drains Eastern Roumelia, makes another unlikely turn, and, again to the advantage of future commerce, chooses the open Egean in preference to the closed waters of the Black sea. Strangest of all, the Danube, which is on one side a Balkan stream, penetrates the otherwise unconquered mass of the Carpathians at the famous Iron Gates.

It follows that one of the remarkable features of the Balkans is the prevalence of the Turkish name "Demirkapu," or gate of iron, a fair sample of which, on a small scale, may be seen between Belgrade and Nish from the luxurious carriages of the Orient express.

It is natural in such a geological confusion that the land should not be without lakes. Of all the scenic attractions which, in no distant future, will make the Balkans a new and more fashionable Switzerland, its lakes will probably be the most popular. Certainly, to-day there does not exist in Europe anything more picturesque than the lake of Ochrida, where all that is attractive in a crowded town by the Riviera is combined with the contrast of the isolated peak above the lake, crowned with mediæval fortresses, and the plain in which it stands, the wooded hills beyond the plain, and the interminable ranges of the Albanian mountains showing purple behind the lake.

It is not surprising, in view of this confusion of features, that the climate also is distinguished for variety. Included in the peninsula we have the balmy Riviera of the north-west, and a winter of Russian rigour in the east, while tropical violence of heat is met with in the south.

There is something entirely its own, also, in the astonishing contrasts of scenery in the Balkan. At times it is perfectly European. In Bosnia, Morihovo, or Rhodope, it is Alpine, with pines and meadows where the mountains above them are of sufficient height. In other districts of Bosnia, and again in parts of the Rhodope, it is absolutely English, and you might imagine yourself in some magnified Haslemere district of Surrey, with a great profusion of pines and bracken. But the typical impression of the commonest form of Balkan country is one of rather arid hills, often of a nakedness like those of Greece, with few trees, but a great prevalence of low scrub, usually oak or beech. Next below these you have the prevailing cultivated land, whose distinctive features are the apparent coarseness of the soil, and the absence of hedges or trees except where the land is dotted with oaks. These are usually lopped close to the trunk to their full height, so as to look like an inferior Lombardy poplar, or else pollarded at 10 or 12 feet, and employed for stacking hay. It is markedly a brown country, and appears more arid than it really is, for it undulates in such a way that even large villages are frequently concealed until you come close upon them. The contrast is then very striking between the treeless country with little green in view except the willows along the river, and on the other hand the extreme luxuriance of the fruit trees round the village; walnuts also grow to an immense size wherever the hand of man chooses to encourage them.

Finally, we have great alluvial plains, some of them extremely rich, but in general giving the impression of wasted aridity, such as we associate rather with Asia. Here we touch the second of the two most notable geographical features in the Balkan, the fact that it is the frontier land of Europe. Here Europe shades into Asia. The shores of the Bosphorus are both alike, yet on the northern side you cannot say that the scenery is anything but European; on the other you may

BUFFALOES IN EUROPE, INDICATING THE PROXIMITY OF ASIA.

equally protest that your surroundings are Asiatic. Thus the two great qualities of the Balkan are these: (1) Its form is that of a broad chaos of mountains, an Italy of a vaster and ruder kind; (2) its position is that of a frontier on the borderland of Asia.

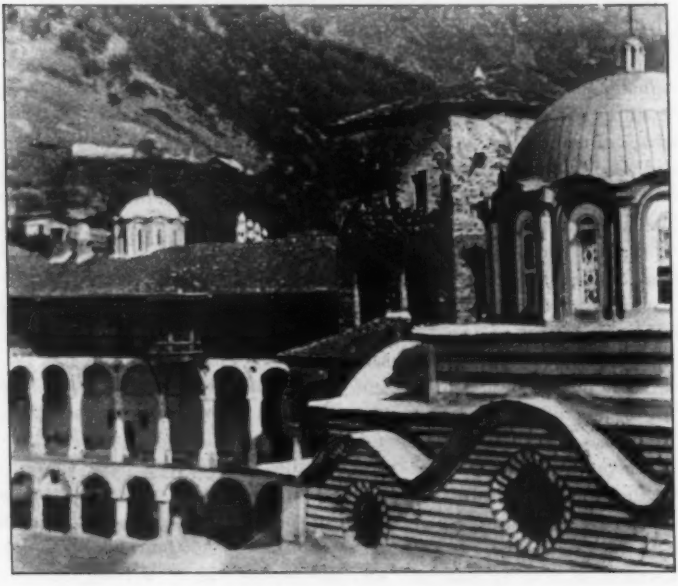
But to generalize effectively requires an expert of the first class; the best that an amateur can do is to say exactly what he saw, and I shall contribute most to interest geographers if I name only the peculiar and striking phenomena that I have seen; these give the country its character, and distinguish Balkan geography from that of other lands.

What is the notable characteristic of Balkan geography? The student of the picturesque might claim that the Balkan is a land above all others of striking scenery. He might dwell on the fact that it includes some of the most famous features of the world, particularly in respect of lakes, of harbours, and of hills. Certainly among the sights of the world should be included the Gulf of Cattaro, where the steamer threads her way under black walls of rock 4000 feet high, into the very heart of the Balkan range. Those who have seen Ochrida are bound to claim it as a thing unique; and the remote valley of Rilo, framed in peaks and forests, and set as with a gem by the gilded roofs of the vast

monastery, forms, undoubtedly, one of the wonders of the Earth. Or, again, we might select as the distinguishing note of the Balkans the quality of variety. But I think that which is most typical is a certain habit of contrast, amounting almost to paradox. When the peninsula has been explored, this will form a rich store of material to every geographical society. Time will only permit now of a few further examples.

Whereas in Italy the great plains assume their natural position at the foot of the mountains, in the Balkan they often occupy the heights. Thus, also, the rivers rise in plains. Before plunging through deep gorges, they have wound a sluggish course through muddy creeks upon such high plateaux as those of Kossovo, where the notorious Austrian railway is now to be constructed. Here no less than three great rivers rise and flow in different directions, the Drin, the Morava, and the Vardar. On the plain of Sofia, at the very centre of the peninsula, although at the foot of towering mountains, you are yet at such an altitude that the climate is bracing, like the Riffel Alp.

A very peculiar form of plain is the absolutely flat deposit of soil in a basin sharply surrounded by steep hills. These are known by the Slav name of Polie, and are most marked in the north-west and in Montenegro, where, on a tiny scale, almost hidden among the interminable



RILO MONASTERY IN BULGARIA.

rocks, they form the sole means of subsistence of the Montenegrin peasant. They are, in a magnified form, the counterpart of the pot-holes of Yorkshire.

Similarly, the enormous limestone rivers which spring suddenly to birth are exaggerations of our own chalk streams; and, indeed, it is difficult to distinguish the delightful gradations of English chalk-country till one has seen the same features in their most obvious form in the Balkans.

Sometimes these streams are not exaggerated, but exact, reproductions of Hampshire trout-streams. The most astonishing combination of contrasts of this kind is to be found at Philippi. Driving from Drama, where the British officers are quartered, along the only road in European Turkey which appears to be secure and employed for commerce, you come across the plain to a Turkish inn. A few yards away are the remains of the Roman town, and vast Corinthian columns stand up among the bare fields without any indication that there had ever been reason for men to collect and live upon the spot. A little below, on the very edge of the plain, there are willows, and what looks from a distance like an oasis in a desert; but strolling down to the water, you find without exception all the notable features of a Hampshire trout-stream. Rising suddenly in a reedy marsh, it glides away with even course and regular depth through meadows with fine grass and absolutely crystalline water. You see something rise in the water as you walk along the bank, exactly like a trout. And here alone does the slightest difference appear between the Macedonian and the English stream, for the trout proves to be a water-tortoise.

Elsewhere, and especially I remember on the northern slope of the Rhodope, you come suddenly on a grassy hillside with straggling woods of Scotch fir, where you can hardly believe yourself to be elsewhere than in Forfarshire, till, riding down towards the vineyards of the lower country, you hear a shout in front of the cavalcade, and see a couple of bears galloping off into the wood.

On the southern side of the ranges the pines seem to find insufficient moisture. But on the other you get the autumn colours of Northern Europe in their most gorgeous quality. Pear-trees, which stud the slopes of the Rhodope, turn in September to a scarlet which is certainly not rivalled elsewhere, and I have never seen a more astonishing effect than a pear-tree half covered with wild vine, adding a different hue of scarlet as well as of gold. Occasionally the contrast is thrown into more striking proximity, where on the southern side of a range the shoulders run to a sharp edge, and you may notice a series of such shoulders, in every case growing pine trees on the south-west side, exactly to the sharp edge of the ridge, while on the east, where the soil is dried by the early sun for the whole day, no tree contrives to exist.

Within a few miles of the splendid forests of *Pinus Macedonica*, you

find yourself on the plains among tropical palms. Whereas the British Empire must stretch from Canada to India in order to exert "Dominion over palm and pine," the Sultan of Turkey includes both in Macedonia. From the palms, again, a few hours' ride takes you to fields of mountain colchicum, the autumn crocus. Starting in the early morning before sunrise, I have seen acres of these flowers lying in the frost as if dead upon the grass. An hour later, when the sun had climbed over the hill, they start up and open to such width that the whole hill-side will be violet-coloured in a few minutes. Higher up, again, in springtime you see grape-hyacinths and chionodoxa, contrasting their azure blue, as they ought to do, with the snow. But in the same day you may find yourself down in the valley pursuing an English lane with blackberries and sloes and travellers' joy.

The quality of contrast is not confined to inanimate things. You may see the gorgeous roller, who reminds you of India, and, close by, the homely water-ouzel. By the side of oaks and walnuts you find great tortoises and snakes 8 feet long; and bears and wolves abound. They are a serious drag upon industry, and even in civilized Bulgaria it has lately been found necessary to increase the Government rewards for killing them. I believe it to be a true story that a party of peasants with horses was not long ago wholly destroyed by wolves in the Mori Hovo mountains, nothing but the bits and stirrup-irons being found to record them. In the same hills the peasants migrate for the summer to lofty shoulders, where the land is flat enough to grow little patches of maize, and here, night after night, they will sit up with a fire to drive off bears; there are tragic stories of women with a baby in one arm, beating off a bear with the other with a burning brand from the fire. The prevalence of eagles is a delightful feature for the traveller, and on the cliffs of Montenegro I once counted, at the same moment, thirty-nine ravens.

The paradox observable in nature extends to Man, and I hope geographers will ere long collect further proof of the point which I now wish to make—that here is a case of the influence of geographical conditions upon man of extraordinary interest.

The Balkan is a country of mixed types of humanity. You have six separate states, and even more distinct nationalities. You have the Albanian, universally famed for his loyalty, his love of country, his preference for living on the fruits of other men's labour, with his interesting language and character, yet without any political existence—without even a government provided by another power, and forbidden to exercise the ordinary rights of man to such an extent that only outside Albania is there a single book allowed to be printed in the Albanian tongue. You have the Greek, clever and active, and conspicuous as a trader and a politician. You have the Serb, full of poetry

and romance; you have the Bulgar, noted for industry on the land and for a curious stubborn optimism so remarkable that I must give an example. An Italian officer lately received an answer from a Macedonian Bulgar that illustrates it well. The men of a certain village were accustomed to cut wood on the mountain, but so many of them had been killed when at work that the officer asked them why they continued to run the risk. The peasant replied, "Why should we not continue to cut wood? If we are not killed we shall bring back the wood." You have Wallachians, Jews, and Mohammedan Bulgars, descendants of Slavs converted by force, as well as Greeks of the same kind. All these add to the confusion of types; and, finally, you have the dominating Turks, of a temperament wholly different to all the others, admirably fitted to make useful peasants, normally a sleeping volcano, but under present circumstances a volcano in full eruption.

What is the cause of this confusion of types? It is the geographical situation of the Balkans as the debatable frontier land between Europe and Asia, combined with its mountainous character.

Many paradoxical contrasts are produced by this confusion of races and religions. It must strike you as a very remarkable thing when you first go among the Pomaks, as the Moslem Bulgars are called, to see the peculiarly aggressive expression that characterizes Mahommedans, combined with the blue eyes that suggest Europe; the colour is inappropriate, as you judge from experience of Turkish faces. Incidentally, it is a curious phenomenon that these blue eyes are not common among the Bulgarians proper, which appears to indicate some difference in blood, contrary to the theory that the Pomaks are of the same race.

The combination of European blood with Asiatic religion produces a pleasant contrast in Bosnia. The Moslem fatalism which takes full effect in a Turkish country produces a general air of decay, and much indifference to economic progress, but it is powerless among the Bosnian Slavs to remove their natural industry and optimism, and Mahommedanism takes on quite a different colour when you see a number of clean and well-dressed men of business attending spotless and up-to-date mosques with an air of progressive activity.

I found a still older combination in one of the educated Mohammedans at Serajevo. He had been taken in to the Austrian Governmental service. He was descended from a notable family of Bogomils, those early Protestants who, at the Conquest, preferred Islam to the persecutions of the Greek and the Roman Church, and became the most fanatical of Mahommedans. My friend and I engaged this gentleman as dragoman, and started out with him on the first day with a modest lunch, largely of ham and whisky, with suitable food for the true believer; we bashfully produced the ham, fearing to offend him, but to our great disgust he proved even fonder of ham than ourselves, as also of whisky.

It appeared that, though a Mahommedan, he was what he called a Liberal. We afterwards crossed into Montenegro, where his fez might have proved unpopular. But here to our surprise he appeared in a European cap, till we again crossed the frontier, this time into Turkey. In all, he changed his religion three times, avoiding awkward consequences with great skill except on one occasion at the famous monastery of Ostrog, where he found it convenient to join with us in declaring himself a Protestant. Here he was completely cornered by an inquisitive monk, who demanded a full explanation of Protestant views upon the worship of the Virgin.

You have other strange products in the way of human nature. The Albanians are divided among the Mahommedan, Latin, and Greek orthodox creeds, but their religion is of a precautionary character. I have known an Albanian chief, nominally a Mahommedan, who attended the mosque on occasion, but also maintained in the precincts of one of his castles, a small orthodox monastery, which guarded a mediæval Christian chapel, and here he maintained a Greek monk in virtual captivity.

Again, you have a strange anomaly in the shape of a married Roman Catholic clergy, the Uniates, as they are called, mostly descendants of Bulgarians who applied for membership of the Roman Church some forty years ago, having received special dispensation from the Pope.

Finally, you have priests who, in place of any Christian function, have become busy organizers of murder for their nation's sake; and in the last few years you have large numbers of men, of a naturally good *morale* as men go, turned in point of conduct to brutal beasts, devoting the admirable powers of a European people to acts of diabolical cruelty. And all this, I maintain, is the result of a purely geographical fact—the situation of the country as the outpost of Europe.

What, then, are some of the results of the inter-action between the geographical conditions of the Balkans and the various types of humanity that play their part in this environment? In other words, How does the geography of the Balkans affect Industry? Both production and transport are profoundly influenced by it. And, again, the peculiar effect is—Paradox.

Take the two great qualities that we have observed in the Balkans: its mountainous physique and its inter-continental situation. The first has profoundly affected industry by inspiring the habit of aspiration, by offering the chance of freedom to live and earn the fruits of work in civilized fashion. Thus, over a large part of the peninsula people have arrived at the opportunity of industrial progress. At the same time owing to the remaining influence of the second feature—the neighbourhood of Asia—industry is still in a mediæval form. You

have open threshing-floors with ponies treading the corn, and you have everywhere that most perfect combination of Man and Nature, whether in England or elsewhere—the water-mill—in great abundance.

Where the aspiration given by the mountains has produced national freedom, you have some of the happiest lands. It is true that you have strange contrasts. While, as you travel on the Danube steamer, you may see automatic reaping and binding machines from Lincoln or Ipswich, being landed for the Balkan peasant, his neighbour is usually living in needless poverty because he prefers still to turn the soil with his wooden plough. But the traveller will immediately see that he has passed into a world of exceptional charms. Ancient and gorgeous

A MARKET IN THE LIBERATED BALKAN COUNTRY.

national dress confronts him at every village; there is a deep current of prosperity and happiness following on liberation. The monasteries, formerly robbed and ruined, but always the centre of national hopes, are now the scene of such festivity as the west has forgotten. At Rilo or Studenitza or Trojan, thousands of pilgrims gather to celebrate the great festivals of the Church. Treated as the guests of the monastery and fed by the monastic kitchen, which at Rilo has a cauldron capable of stewing two oxen at once, they spend the days in a happy combination of commerce and festivity; dancing occupies the evening, and you may still see the blind minstrels of Homeric quality, singing of national glories to the home-made guitar. Religion, also, has its

place. Service in the chapel begins at 5 a.m., and at daybreak you will hardly find standing room.

Round the villages there is often a large common, where the dun-coloured cattle of the peasants graze together; in the evening each beast finds his own way home and pushes open the door of his master's yard. In these meadows on Sunday afternoon the village gathers for the national dance; circled round the fiddler or the piper you will often see a hundred men and women footing it with interminable vigour.

Commonly, as civilization increases the picturesque disappears. But in these newly liberated countries the effect is often in the other direction. The minarets usually remain, and there was little else of any beauty before the liberation. The houses are rebuilt with wider eaves. Roads are made and planted with trees, and orchards begin to relieve the monotony of fields with which it was not worth while to tend when the produce was wholly taken from the farmer.

In these countries the mountainous quality of the land, giving liberty, has gained the upper hand. Elsewhere the second feature—nearness to Asia—is still the dominant factor.

Here we have still stranger contrasts. In regard to production, we can hardly believe that this country was once the granary of Rome, so little does it now produce. The man who imports machinery or attempts to better himself by working a factory or mill, is lucky if the Governor does not trump up against him a charge of murder and throw him into prison until he has disgorged his fortune. Thus in literal fact the most attractive industry for a man of energy and efficiency is that of brigandage. Of intellectual professions there is absolutely none to satisfy an active mind. The literature of the country consists of the records of murder kept by the European consols, and the lists drafted by murder committees of those destined to be punished with death.

It would appear from the markets of the large towns that the most profitable field of business is in fire-arms and large knives. But these do not adequately indicate the extent of the trade, for beneath the surface a large importation of modern rifles is carried on from the neighbouring countries into what is left of European Turkey. Here is another strange contrast: I have seen in the mountains the villagers collected for hunting bears with ancient flint-lock rifles, while the Turkish gendarme carried a Martini, and this again was vastly inferior to the Mausers or "Manlichers" which accompany a rebel band. The best of the thought and effort and wealth of the people is thus turned away from real to false industry.

Disorder is even causing a progressive diminution of production. Many a mountain-farm is now unsafe to visit, and a European resident who has done much big-game shooting tells me that recent troubles have in this way greatly increased the stock of red deer. Meanwhile, valuable forests are being rapidly cut down: reafforestation is totally

neglected, being often prevented by the unregulated grazing of herds of goats.

It may even be that the bare and coarse-looking surface of the rich lands of the Balkan is partly due to the absence of that continual human care which, doubtless, in Europe has done much to produce the firm texture of the meadows. In this way the habits of man have affected the landscape; but there is a weird story in Bosnia which puts cause and effect the other way. It is said that a Turkish farmer used every week to miss one of his sheep. At last he discovered that his shepherd, having killed the sheep by the river, threw it into the stream where, in Bosnian fashion, it plunged under the hill. The man's brother waited

INDUSTRIAL WASTE: A BURNT FARM.

at the appointed time to meet the carcase where it emerged from the ground on the other side of the hill. The Turk said nothing about his suspicions, but one day cut the throat of the shepherd, threw him into the river, and enjoyed the thought of the brother's discomfiture when, instead of the sheep, the shepherd's body appeared! It is said in Bosnia that the peculiar features of nature are in this way responsible for the habits of man.

The truth is not so different as might appear. Purely owing to the contiguity of Asia, we have here, among a people of European stock, good *morale*, great ability, and the mentality of civilized Christendom, a periodical destruction of all the means of industry and domestic life. More strange than this, we have such daily discouragement of

economic work that we stand astonished before the hardihood which prompts the peasant laboriously to rebuild the whole fabric of his industrial life as soon as the whirlwind has passed.

One of the rich countries of the world is actually turned into a source of heavy loss to the state which attempts to govern it, and even beside the modern steam-mills of Salonika, protected by their foreign ownership, perpetual murder goes unpunished.

The greatest proof of our thesis that geographical factors are mainly responsible will be found in connection with the greatest modern industry. The methods of transport in the Balkans range from the luxury of a French sleeping-car to the still prevalent plan by which whole families, when the annual migration takes place between the plains and the hills, are fastened on the backs of one or two ponies, the heads and arms of the smaller infants protruding from different parts of the family stock of blankets!

Nothing is more needed for the industrial development of the Balkans than railways. But so far, over a large area, the few railways that exist are built for strategy alone. There must be really commercial, non-political railways. To illustrate the extent to which geography has prevented this primary development of industry, the R.G.S. has prepared a special map, designed to call attention to the contrast between railways actually built and those which would exist but for the geographical influence of Asia—an influence which can and will be modified. These include both those which are now proposed, and others which are economically desirable.

The Austrian Novi Bazar line, which has had such startling results, was forecast by the Berlin Treaty thirty years ago; and the work has lately been pushed on with feverish haste to the Turkish frontier. It is strategic, but no less welcome. Through traffic goes quicker through Servia, and the Bosnian line is, moreover, only "narrow gauge." Austria, also, favours the connecting-line with Greece. The turmoil raised by the Austrian advance showed at all events what other States thought of its character. The "Slav line" from Servia to the Adriatic at once achieved reality. Russia gave it her patronage, and Austria has given it her formal support. This line gives Servia the double advantage of closer access to "Old Servia," the historic Servian district, now cruelly impoverished by Albanians as well as Turks; and also of access to the sea.

A modified form of this scheme is proposed by Montenegro, whose Prince declares that unless the route is through his country, the port of Antivari shall not be used. This view has Italian support.

Italy has been working hard in Montenegro, and has built a line already, some distance towards Podgoritra. She also urges another trans-Pindus route, from Monastir to Durazzo, along the old Roman

road. These schemes are strategic, but also economic. The maps kindly prepared by the R.G.S. show that their construction is perfectly feasible. But in a normal condition of public order, many other lines would be built for economic motives alone. Such are those that follow the valleys of the Struma and Mesta. What would be done with a state of security may be judged from the wonderful progress of railways in Bulgaria, a country till thirty years ago in the same condition as Macedonia to-day.

It will be seen that one geographical influence is still at strife with another; but "the Battle of the Railways," which began in January, initiates a reconciliation, for all the proposed lines are economic, even

THE PRESENT CONDITION OF THE AUSTRIAN RAILWAY ROUTE.

the Austrian strategic railway which led to the crisis. Some of the lines will pay by reason of through traffic, all of them by means of local development. Even those which run through mountainous country will pay when the nature of the government permits of mining. My evidence for this statement will be strongest if I quote the actual consular report of our own government. The consul at Ushub says—

"As there are no official statistics and all figures must be obtained by private inquiry, their accuracy is at the best only approximate.

"The province of Kossovo possesses all the latent possibilities of very real prosperity, but political conditions at present frighten capitalists and paralyze industry.

"There are mines of every description in the province, and the mineral wealth of the country is said to be comparable with that of the Transvaal, but owing to the great difficulties of transport and the insecurity of the country, few mines have been exploited up to the present, but concessions are now being more eagerly sought after. Gold, silver, copper, iron, chrome, lead, antimony, and manganese, besides coal (lignite), have all been found in considerable quantities, and fresh discoveries of lodes are continually being made. A British company will this year start working a silver and lead mine near Kratova, which is believed to have very good prospects; it was worked by the ancient Greeks, and is one of the mines mentioned by Herodotus. The chrome mines near Kalkandelen cannot yet enter into competition with the New Caledonian chrome mines owing to the excessively costly transport of the mineral to the coast. Coal mines are plentiful, as at Kalkandelen, Prisren, Yeniky, etc., but the quality does not appear to be very satisfactory.

"There are quarries of excellent building stone on every side. Further, a small slate quarry is situated at Papadia, and supplies local needs.

"The soil produces excellent cereals, tobacco, opium, and poppy seed; in some districts the pasturage is all that can be desired; and in the western (Albanian) region fruit trees do well, especially apples and plums. As before mentioned, a fine edible grape comes from Strumnitza.

"In some of the less accessible parts of the province there are immense forests of oak, beech, fir, pine, ash, and chestnut, which, according to official statistics, cover an area of 750,000 acres of ground. On the other hand, the Turks, with their dislike of cover, have cut down all the forests in the vicinity of the towns, and firewood is now scarce. However, owing to the establishment of a saw mill at Mitrovitza, planks for building purposes are beginning to be supplied by the country itself."

The chief feature of the situation to-day is Waste. Firstly, Europe has no access to Greece; that is to say, she is neglecting by far the nearest route to Egypt and the East. Again, half the trade of the Balkans is virtually debarred from its natural outlet on the Egean sea. Most wasteful of all, the other half is unproductive for want of government. Finally, this last fact prevents the development even of the free states. Through traffic being impossible, there is not a single railway bridge across the Danube from Belgrad to a spot near the mouth; so that to travel by rail from Russia or Bucharest to Bulgaria, you must go round by Hungary.

What are the factors which cause this waste? They are: first, disorder, minimizing production, actually necessitating a continuous line of soldiers along every line in European Turkey, and preventing the building of new lines except where the Government guarantees

the revenue. These guarantees make the railway an actual injury to the country. The guarantee of the Austrian lines is 7000 francs per kilometre. The German and French lines have more than double this amount. The German has lived, by this means, on the local taxpayers to the extent of £50,000 sterling per annum; the French of no less than £220,000 per annum. Thus the companies have no motive for developing traffic, and, as the lines avoid the sea and the towns, it is even discouraged. Only in 1897, when the Greco-Turkish war brought good trade (actually trebling that of the German line), did the French subsidy fall below £175,000.

INDUSTRIAL WASTE: MOSLEM ALBANIANS FULLY ARMED.

Military strategy is another anti-economic factor. The unsettled claims to Turkish Europe are responsible for opposition on grounds of strategy, and the Italian, Servian, Montenegrin, and Bulgarian schemes.

Another factor, closely allied with the last, is the partiality of local interests arising from artificial boundaries. Goods from South-West Bulgaria, which is not far from Salonica, are sent round by the Black sea, in order to aid the ports of Varna and Bourgas; while the Sultan suppresses his Adriatic ports because he has property at Salonica.

But "the railway rush" has begun, and before many years have passed, we shall wonder how Europe tolerated so long the absurdities we see to-day. The European and mountainous quality of the Balkan

peninsula will have overcome the influence of its marginal, semi-Asiatic, situation.

In conclusion, I ask you to remember that we are solely considering the question put forward by the Society as the proper subject for discussion. How far Man and Industry in this country have been influenced by the geographical conditions? All frontier countries, even Afghanistan or Persia, must in these modern times be the scene of confusion and paradox, and are properly the subject of special study, to be encouraged by geographical scholarships or any available means. But I would venture to urge that when such a country lies at our very doors, the call to our geographical societies to throw light on it is more than ever paramount.

The PRESIDENT: Although the lecturer of the evening, Mr. Noel Buxton, has been some ten years or more a Fellow of our Society, I think that the older members among us probably regard him rather as the son of Sir Fowell Buxton, whom we are glad to see here to-night. It may interest you to know, that Sir Fowell was elected a Fellow of the Society in the year 1858, so that this year he may be said to be keeping his golden wedding with Geography. Of course, Mr. Noel Buxton, as a geographer, stands upon his own feet, and as regards the portion of the world about which he is going to address us, the Balkans, he has not only travelled extensively there, but is also regarded as one of the leading authorities. I will now call upon Mr. Buxton to read his paper.

Mr. HOGARTH: I am sure we all thank Mr. Noel Buxton for calling our attention to so interesting a country as Macedonia, a country which, after all, is so singularly little known to us here in the west. Even if it is no longer quite true, as Gibbon said, that on one side of the Adriatic is a country as little known to Europe as Central Africa—although perhaps, relatively, that does still continue to be true, for, while we know a good deal about Albania, we also know a good deal more about Central Africa—at the same time it is true that Albania is the least-known part of Europe, and Macedonia is not much better known. It is a singularly interesting country, and also a valuable country. Mr. Buxton has spoken to us about the remarkable variety of scenery which it presents, the remarkable difference between the highlands and uplands. I would only recall your attention to the fact that the best cigarette-tobacco in the world comes from Macedonia; that all the best tobacco (when it is tobacco at all) in European cigarettes comes from Macedonia; and that when it does not come from Macedonia, it is said to come from there. It is, as Mr. Buxton said, a country of very great contrasts; and it happens to lie within an area of Europe which has a fairly abundant rainfall. Mr. Buxton has, of course, indicated to you quite sufficiently why that country is in the condition in which it is. He said, and quite sincerely, that he intended to avoid politics; but it is perfectly impossible, in this connection, to avoid politics, or at any rate to avoid, I won't say the suspicion of them, but the reflection of them. Mr. Buxton spoke to you about the marginal Asiatic character of Macedonia. That, of course, results simply from the continuance of a certain form of government, and means a certain state of political conditions. The reason why Macedonia is such a turbulent country under its present Government is supplied, on the one hand, by its geographical character—its Swiss character, as Mr. Buxton has very well called

it; and on the other, by the fact that it was not conquered solely for Islam by the Ottoman Turks. If you regard the Ottoman empire without going into its earlier history you may forget that the greater part of it in Asia was not originally conquered by the Ottoman Turks, but by other races of Turks, other races of Mohammedans holding sway before the Ottoman Turks, which had quite different ideals as regards the spread of religion. These were first and foremost proselytizers, and they forced the inhabitants to adopt the Mohammedan religion; they conquered, in fact, first and foremost for Allah, and only, in the second place, for their own personal gain. That, of course, was pre-eminently true of the Arabs, wherever they went. An Ottoman Turk, when he conquered, conquered first and foremost for himself, and only in the second place for the Allah of the Moslems, and he was, therefore, very careful not to convert beyond a certain point. Careful not to preclude himself from having serfs and slaves to his order, people who had not the privileges of the Moslem sacred law—hewers of wood and drawers of water. The Ottoman Turk, therefore, only converted the population to a certain point. He established garrisons in the country, and was perfectly indifferent as to what happened to the rest of the inhabitants; indeed, from the very first, up to this day, he has fostered disorder and disunion in the country. The result is, that there is not in Macedonia, and never will be, anything like the peace and the order which prevails upon the great plains and great plateaus of Asia Minor.

It is not, of course, our function to-night to debate about the means which may be taken to bring that state of things to an end; but it does come within the province of this Society to consider how far the condition of Macedonia may be slowly and effectively remedied by the promotion of railway enterprise. I would only say that I hope no selfish considerations will ever prompt this country to put any hindrance in the way of railway development in Turkey. A very great responsibility rests upon any nation which prevents the extension of railways in a country so comparatively undeveloped as Turkey in Europe at this moment. And this applies to Macedonia. Macedonia is a country which wants railways, and, as Mr. Buxton pointed out, the natural outlets are all on the Ægean sea. The country slopes down to the Ægean sea. From that great tableland of Kossovo there are at least three main routes which lead down to good harbours, and upon those routes railways are the only means of communication which are likely to be useful. The rivers, although of considerable magnitude, fall so steeply, and are so subject to differences of level in winter and summer, that they can never be expected to supply effective means of water-transit. I think that in the near future we shall see at any rate a beginning of the construction of railways. We need not be too precise as to whether these railways are, or are not, strategical. A strategical railway has to follow more or less natural lines of communication. Experience has shown that population will follow the railway, and that a railway, if it is made anywhere, is pretty sure to cause an extension of trade. The chief thing that we have to see to, so far as our political influence extends, is that those bad economic terms are not imposed, under which most of the strategical railways have been made. Mr. Buxton has described those to you in figures which you may not have followed sufficiently well to realize their enormity. In the case of a certain recently constructed line, the Government have had to give a guarantee of 13,000 francs per kilometre. The maximum earnings which can be foreseen for that line for many years to come are between six and seven thousand francs per kilometre. That means that the railway is going to be a drain on the local taxpayer for more than half its expenses for about as long as we can foresee. That is a very bad state of affairs, and should not be tolerated. Railways can be constructed independent of the kilometre guarantee. It can be done, and it has been

done with the British line from Smyrna to Dineir. That line has never had a kilometre guarantee, and is carried on at a very respectable profit. Let us not put any unnecessary political difficulties in the way of the construction of railways in Macedonia, but use our immense influence to provide that the local taxpayer, whether Moslem or Christian, be not burdened with a wholly unfair tax upon his daily earnings in favour of large capitalists and company promoters in other countries of Europe—England, France, or Germany.

Mr. MACKINDER: I cannot pretend to the local knowledge of Mr. Noel Buxton or of Mr. Hogarth, and would venture to limit what I have to say to two remarks. I think that the maps usually available hardly suffice to show how natural is the proposed railway to the Adriatic sea. There are two lines drawn in red on the hand-map before us, from the town of Nish south-westward to the Adriatic sea. These two lines, the Montenegrin and Albanian alternatives, both run through a hollow—as it were a street cut right athwart the Dinaric and Pindus backbone of the peninsula. The fact is that Bosnia, Herzegovina, Montenegro, and western Servia should be thought of as a plateau, which comes to an end with a sharp brink, overlooking the hollow through which these two lines are drawn. There is a second brink south of the second of the lines, and thence a mountainous district extends southward through Albania. Thus in reality there is no backbone running down the west side of the Balkan peninsula; but where you see the change in direction in the east coast of the Adriatic sea, there is a natural thoroughfare from the Adriatic coast northeastward leading into Servia. What is proposed is to construct a railway through that, which, so far as gradients are concerned, is far more natural than the railway which is proposed, for strategic and other reasons, from Bosnia to the Ægean sea. The rivers, of course, do not indicate these facts, and the only map upon which they come out, I think, with sufficient significance, is the Austrian Staff map. The essence of the matter is that we are not dealing with a range of mountains, but with two plateau regions, and between them a deep gutter.

As to my second point, I do not think, if Mr. Buxton will allow me to say so, that it is a quite sufficient analysis of geographical influence upon the present human conditions in the Balkan peninsula, to say that this is a marginal region; rather, I would venture to say, it is the central region which lies between Europe and Asia, and for that reason must be one of two things—either the seat of conflict or the seat of Empire. It has been the seat of Empire through long centuries, as Mr. Buxton said in an early part of his address. At Constantinople you had the great city which set at defiance both the Slavs of the west and the Saracens of the east. The present condition of the Balkan peninsula is a significant illustration of the fact that thorough conquest may be humane, but incomplete conquest is the most inhumane thing there can be. Just because Rome conquered in the west, and, because of prior Greek civilization, did not conquer in the east, and because the Turk also, though for more sinister motives, did not conquer the east completely, therefore this central district, when it ceased to be the seat of empire, passed into a condition of unstable equilibrium, with warring intermixed peoples and no dominant nationality.

I entirely agree with Mr. Hogarth's idea, that we ought to foster the making of railways here. The more we develop this region commercially, the more we shall tend in the long run to build up a centre of force which will prevent this portion of Europe and Asia from being the seat of conflict. It must either be the seat of force acting outward, or the centre of the conflicting forces acting from without. I do not think, sir, I can say any more, than that I have listened with extreme interest to the very graphic illustrations of the scenery and the climate which Mr. Buxton has drawn for us. With reference to his idea of research

scholarships, I would venture to suggest that the thing to do is to find the right man and to endow him, and not to offer for competition chances which may, or may not, attract the right man.

Mr. CHISHOLM: After what has been said by Mr. Hogarth and Mr. Mackinder there is practically nothing left for me to say; and, in fact, almost all I could say would be to echo the last words that have fallen from Mr. Mackinder, and to say on my own behalf that I have listened to this paper with the very greatest amount of interest. Seeing, however, that you have asked me to say a few words, I will take the opportunity to give expression to one or two generalities. What I have to say is founded upon the very hopeful forecast that was made by Mr. Buxton himself, and also supported by Mr. Hogarth. Mr. Buxton says about the conclusion of the paper, "the railway rush has begun, and that before many years have passed we shall wonder how Europe tolerated so long the absurdity we see to-day." I am glad to think that we may accept that statement with a very considerable amount of confidence. It has often been remarked that the last century that human history has passed through has perhaps done more for the world in some directions than all the other centuries put together; and in fact, I am now old enough to reflect with a good deal of surprise upon some of the astonishing changes that have been in my lifetime. When Japan first began to be opened up to Europeans, I can remember reading the leader-writers in our papers urging our merchants to make hay while the sun shone, and warning them that Japan would soon go back to the condition in which it was before. Well, I have lived to see that and many a similar forecast falsified. With regard to railway construction, one thing noticeable is this, that once an important railway has been made through a country it alters the economic equilibrium, and creates the desire for more railways. I am very glad to think that the forecast which has been expressed by Mr. Buxton is very likely to be verified.

H.E. the SERVIAN MINISTER: Having the honour of being here to-night as a guest of the Royal Geographical Society, I very highly appreciate being called upon now to say a few words after the very interesting paper which Mr. Buxton has read to us, and after the very interesting and able remarks which have been made by Mr. Hogarth and Mr. Mackinder. Of course it has been said that no political discussion can take place in this room. But this restriction does not diminish the importance of what has been said and of the subjects of this evening's discussion. There is, in the first place, the scientific geographical interest which has been shown in the Balkans, and the character of their inhabitants. On the other hand, the construction of the different railway lines which are now under consideration is of such prominent importance to all the regions concerned, that I think it is quite sufficient to dwell upon those two points. As the representative of one of the countries of the Balkan peninsula it is quite obvious that I should have to lay before you a good many different observations concerning the details of the subjects discussed. But I am not prepared to speak to-night at length on the subject, nor should I like to detain you longer at this late hour. I feel, however, bound to express my very deep thanks for the very interesting remarks which Mr. Buxton communicated to us. Having travelled so much in the Balkan peninsula, he is fully authorized to do so. I should further like to point out how much our own country is interested in the construction of the railway from our frontier to the Adriatic sea. This line will give to Servia a direct outlet to the Adriatic, and revive the commercial routes which were in use centuries ago, when several important routes led from the coast to the interior of the Balkan peninsula, thus linking it up with Italy and the west of Europe. This railway will, without any doubt, improve the commercial position and economic

situation of our country and of the people living beyond our border. I may only be allowed to add that I feel sure that the interest which has been shown in this learned and distinguished assembly for the different railway schemes will have the most sympathetic echo from the scientific people of my country, as well as all the classes interested in the development of commerce.

Colonel PLUNKETT: Mr. Buxton has given us a most interesting picture in one of his slides—the distribution of the different races, but he omitted to mention the traces of the old Roman and Italian civilization, which are a very important feature on that coast. Politics are not allowed here, but in the spread and progress of civilization we are all interested, and I think we may see some recent revival of that old civilization which was once so distinct and which nearly disappeared; the making of railways from the interior to the Adriatic, more especially, perhaps, the southern of those marked, would convey that civilization into the interior, and in this way help to diffuse the highest type of civilization that has, since the old days of Greece, penetrated the peninsula. I hope Mr. Buxton will say something as to that very interesting feature, which I have noticed myself on that coast. I think we are all greatly indebted to him for his very interesting paper.

Prof. LYDE: If I may be allowed to say a few words, there is also a point which I should wish to raise as to the use of the words European and Asiatic throughout Mr. Buxton's lecture, in a sense which appears to me to lend itself to an underlying fallacy. Especially with regard to the Balkans where they have been used, I think it is particularly essential that these words should be defined. There is the fallacy of, on the one hand, distinguishing the geography of Asia from the geography of the rest of the world, and, on the other hand, transferring adjectives to other meanings not covered by geographical conditions. I should therefore be extremely interested if Mr. Buxton would explain in what sense a race coming originally from Asia, which has settled in Europe 500 years ago, is called Asiatic, whereas another race equally coming from Asia, but 2000 years ago, is essentially European. I should also be glad to know in what sense certain qualities found in mixed races in the Balkans, which do not happen to agree with the accepted western view of character, are to be classified as Asiatic and put down to an Asiatic origin, while other characteristics which suit the principles of our age are to be classed as European.

I do not believe in the commercial future of railways which have a bridge of 250 feet every 6000 yards, and a tunnel of 450 feet every 1800 yards. Besides, there are no products to go to the Adriatic. In Rumania the population is massed in the east, and in South-East Servia the climate and products are purely "Mediterranean," and are not wanted in Mediterranean markets. The horned-cattle of North-West Servia might go, but ought to be kept at home for ploughing. In any case, the whole tendency of traffic now is to go direct to its destination, and the destination of any mid-Balkan products is in the big non-Mediterranean markets of North-West Europe. To tell of Servia being in "economic bondage" to her great neighbour seems perilously near nonsense when the significant feature of the contraband trade of the area is that it goes *north*.

As to the railways making for peace, I don't believe that railways, which go through strategic centres in districts where they have no products to carry, make for peace. The "Russian" line is projected through a belt of Slav population using Russian characters the whole way from the Danube to the Adriatic, and deviates to the centre of all the old military and political turmoil—Prizrend. The "Austrian" line taps the Ibar valley in which Pompey resided nearly two thousand years ago. If any railway is made, *all* the projected lines should be made.

Mr. W. A. MOORE: With regard to the last speaker but one, while I quite

agree with what he said as to the strategical intention of the Bosnian railway and also as to the strategic importance of the Serb-Adriatic line there there is one consideration which I should like to suggest, and that is this, that if the section of the railway that runs now through Nisch to Salonika were running under proper commercial economic conditions through what we call a civilized country, and if the harbour at Salonika were cleared and it were allowed to take its place as a great port—as one day it must—you would then have something which Prof. Lyde might bring into his scheme of traffic going north-west, because if you cast your eye on London, and then on Salonika, following the Orient express route across Europe through Vienna, and pursue the railway from Nisch to Salonika, and then in the same straight line southward by the water, you come to Cairo. Even now there is much traffic between Egypt and Salonika, and if the latter were a civilized commercial port, as it must some day be, then that would be the great continental route to Egypt, and you would have the traffic going north-west to Central Europe and the Continent. The projected lines, for instance, the Monastir-Avlona line, would then play an important part as branches of a great trunk route between London, Cairo, and the East.

The PRESIDENT: I am sure we shall all agree as to the extreme ability of the paper read by Mr. Buxton. I thank him on behalf of the Society for the careful way in which he has steered clear of politics. He was careful not to cross his "t's" and dot his "i's," in regard to certain matters, and I am very glad he did not do so. We have also had a very interesting discussion, and I am sure you would wish to thank the speakers for the able contributions they have made to the question.

Mr. BUXTON: I beg to express my great pleasure in your most kind words; it is not for me to do more than thank you, except to make one comment. If I have been guilty of terminological inexactitude in using the word "Asia," I can only plead that its bearing is not great upon the question of geographical influence on human industry. With regard to Prof. Lyde's remarks, I think that the objections he made to railway development are answered by the fact that they would have applied to the prospect of similar development in Bulgaria, or any of the northern parts of the peninsula; but whereas they might have been held to make it futile to speak of railway development, this has been very great in those parts, and I think it has been to the immense advantage of industrial progress. The difficulty is answered by this fact, and is really dealt with by that unalterable law, Supply creates demand.

JOURNEY ON UPPER SALWIN, OCTOBER—DECEMBER, 1905.*

By GEORGE FORREST.

THE journey described in this paper was undertaken by the late Mr. Litton. His object in making the journey was both political and geographical: first, to discover whether the Salwin and Irawadi dividing range formed a distinct geographical and ethnographical boundary between north-west Yunnan and Upper Burma—a fact which the local Chinese authorities, with direct knowledge, and for their own purposes, denied; secondly, to explore that portion of the Salwin valley lying

* Read at the Royal Geographical Society, June 15, 1908. Map, p. 328.

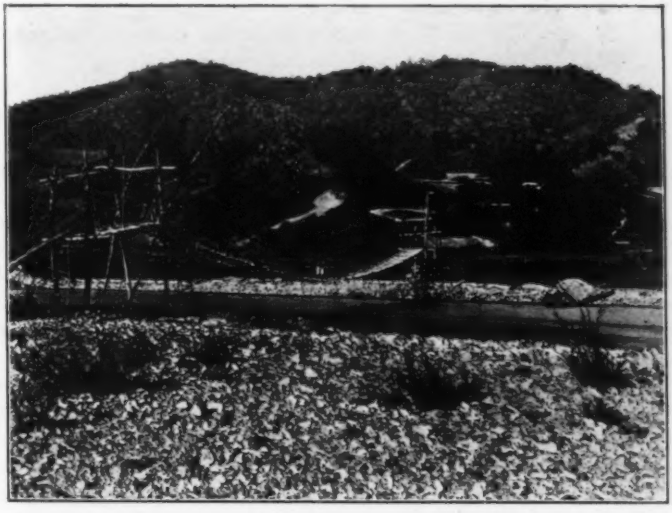
between 26° and 27° 30′ N. lat., which, up to the date of our journey, was unknown. Mr. Litton received special permission from his Majesty's minister at Peking to make the journey. I accompanied him as friend and assistant, but primarily to prosecute further my botanical collecting, in an entirely new region. The journey was distinctly made under the leadership of Mr. Litton. The paper is a joint composition of Mr. Litton and myself. Mr. Litton, who was a Fellow of the Royal Geographical Society, would, had he lived, have given the paper himself, or had it communicated. The paper, as submitted by me, is changed in some respects, necessarily so, owing to his death, but I am specially anxious that my friend's major share should not be ignored. The photographs, I may say, were taken by myself.

Starting in perfect weather from Teng-Yueh on October 11, we travelled north, and on the fourth day passed the last Chinese village and encamped near the source of the Shweli, at the north end of the wild and picturesque valley of the Ming-kwong, near the Lissoo hamlet of Ta-chu-pa. The headman soon found us a sufficient number of porters, many of whom had accompanied Mr. Litton on his journey in the previous spring, and a day was spent in apportioning "pei tza," or loads, to be carried on the back, consisting mainly of a reserve supply of rice—a most important item in the baggage, as we could not count on buying any food to speak of in the country to the north of us. A Lissoo can carry on his back for full stages of six to eight hours, in difficult country, about 70 lbs. weight, but he eats about 1 lb. 7 ozs. per day of dry rice.

All preparations for a move forward having been made, our bad luck began. The south-west monsoon returned, and for twelve days an almost continuous deluge ensued. After waiting in vain for three days, we made a start in the rain, and climbed through the desolate and dripping forest which covers the N'Maikha-Shweli divide. It was only with the greatest difficulty that mules could flounder through the quag-mires, while all the mountain brooks were so swollen as to be nearly impassable. Late in the evening of the second day from Ta-chu-pa we reached the first village in the Irawadi basin, the Lissoo hamlet of Tsu-yu-ho, consisting of a dozen rough shanties, situated in an opening in the mountain ridges. Ourselves and our baggage were thoroughly soaked. It was a choice between camping on sodden ground, under sodden tents and with sodden bedding, or taking refuge under the smoky and verminous shelter of a Lissoo hut. We chose the latter as the lesser evil.

For fully sixty hours at Tsu-yu-ho the deluge continued without intermission, and it was impossible to proceed, as we were everywhere hemmed in by raging torrents. At last we were able to make a short stage north through patches of forest and over ridges clad with dense grass, bracken, and a species of scabious, to the Lashi-Kachin village of

Pien-ma, forty houses, which Mr. Litton had visited during the frontier expedition of April, 1905. We arrived in a perfect downpour, and the stream, which also serves as a road, by which we came, was so swollen that, had we been an hour later, we could hardly have reached our destination. As it was, we lost one of our mules, and with it a bundle of my specimens. The headman put us up in his house, where we had to wait another two days for the cessation of the rain. On the whole we were delayed eight full days by this, for late October, unprecedented downpour. We were further delayed beyond Pien-ma for two or three days in the Ku-tan-ho valley by landslips, broken bridges, and other results of the weather. We never recovered this loss of time; besides,



SUSPENSION BRIDGE, SPAN 100–150 FEET, COMPOSED OF LIANA CANE AND SAPLINGS, ON THE MING-KWONG RIVER.

much of our kit was spoiled; whilst the men got colds, which laid the seeds of subsequent fever, causing later much trouble and delay. This track from Ta-chu-pa to Pien-ma is no longer fit for mule traffic, much of it having been swept away.

Pien-ma and Tsu-yu-ho are two villages nominally subject to the Chinese headman of Teng-keng, on the Salwin, but situated to the west of the divide, which is claimed as the British eastern frontier. The headman of Pien-ma by no means appreciates the benefits of celestial suzerainty; he complained to Mr. Litton that, after the frontier commission, the representatives of Teng-keng had come and seized some of his cattle, and carried off two girls from his village in satisfaction of tribute

supposed to be due. He repeated the request, made to Mr. Litton in April, that the British Government would take the country over and provide means for settling disputes, suppressing feuds, and regulating taxation.

Among the villages north-west of Pien-ma there are continual feuds. Last summer one of these villages took some cattle, which they had stolen, over into Ming-kwong, in China, and sold them there on the bazaar, whereupon the owners of the cattle made reprisals on Ming-kwong traders. The *fu-yi*, or headman, of Ming-kwong accordingly "closed the passes," *i.e.* issued a proclamation that none of the Ming-kwong people were to go over the watershed to Pien-ma; but no one took any notice of the edict, and we met three or four traders *en route* to the Maru country along the upper N'Maikha. The condition of these villages is, in fact, the condition of all villages in that country which are not under the control of British officers. The nominal control of Chinese headmen causes far more trouble than it allays.

Having heard all about Pien-ma politics, we moved east over the Irawadi-Salwin divide by the lonely but beautiful Pien-ma pass, 10,500 feet, and descended the Ku-tan river, a tributary of the Salwin, where the swollen waters caused us much trouble. From the village of Ku-tan we turned north, and on October 30 reached the village of Lu-chang, the residence of a semi-Lissoo chief where Mr. Litton had camped in April. This we intended making our base for exploration further north. The village is in a fine and healthy situation at 6500 feet, some 3000 feet above the Salwin, and the people are most friendly. The chief, who is a boy of some ten years of age, came to ask us for a present of some sweets, and his lady mother, the regent, sent us a present of an unusually large capon. Both there and everywhere else where they went the British and Indian officials seemed to have left an excellent impression on the inhabitants; on our arrival numbers of porters came forward and asked to go north with us, while Mr. Litton received numerous inquiries regarding the various members of the party who had been north that length in the spring. If nothing else was effected by that expedition, at least friendly relations were established with people who had never previously seen or been seen by a European.

From Lu-chang we sent back the baggage animals, and proceeded on foot for three marches northwards—32 miles by the track, but only about 14 as the crow flies. The path leads up and down over a series of ridges descending from west to east down to the Salwin from the N'Maikha divide. To negotiate these ridges is a trial of strength to the traveller's legs. Thus, starting from Lu-chang, at 6400 feet, there is a steep drop of 3300 feet to the Salwin in 4 miles; then follows an ascent of 4000 feet, through grass and pine forests to the top of the ridge, 800 feet above the scattered village of Mao-chao (14 miles from Lu-chang), which, like Lu-chang, amongst its log and bamboo huts,

boasts one tiled house, the so-called yamen, the residence of the hereditary native chief. From Mao-chao there is a rough track which, after some steep ups and downs, plunges down 1500 feet to a tropical jungle of palms and lianas, through which runs one of the mountain torrents which are the only tributaries of the upper Salwin. Then a precipitous climb of 900 feet, through cultivated patches, leads to the ridge of Shih-pai-li-ti (6700 feet, 10 miles from Mao-chao). Between Shih-pai-li-ti and Pei-pa (8 miles) there is an even steeper gully, the bottom of which is 2000 feet below the level of the ridges.

In all this country the villages are scattered along the opener sections of the ridge tops, or on natural terraces in the mountains at

SUSPENSION CHAIN BRIDGE ON THE MEKONG RIVER, ON THE TENG-YUEH-TALIFU ROUTE.

from 5000 to 7000 feet. Above 7000 feet to the top of the divide the country is too steep and rocky, and the forest too dense, to admit of villages or cultivation; below 5000 feet the country is too malarious, but every village has its patch of rice-fields 2000 to 3000 feet below it by the banks of the Salwin, whither the inhabitants descend to sow and reap much as they did in the time of Marco Polo.

One and a half miles distant from Pei-pa, but 1300 feet below it in altitude, is Cheng-ka. Here there is a large open bay in the hills at 3400 feet, admitting of irrigation for some hundreds of acres of paddy land; the people are thus able to live near their fields, and are in a comparatively flourishing condition, possessing flocks of goats and droves of swine.

Cheng-ka, like all the villages along this part of the Salwin, occupies a site commanding splendid views. Far below, the river can just be seen; beyond it, to the east, rise the vast and varied slopes of the Salwin-Mekong divide, dotted with maize-fields and villages; while behind, to the west, tower the sharp ridges and forest-clad heights of the Irawadi parting. The inhabited or temperate zone of the range, say from 5000 to 7000 feet, is thickly cultivated with maize; and groves of pine, oak, and flowering shrubs, with hedgerows, covered in autumn with clusters of a trailing lilac-rose coloured Crawfurdia, pleasantly diversify the view.

As Cheng-ka is the farthest point north where the authority of the Chinese chiefs is more than a myth, I may here give some account of the inhabitants of that section of the Salwin (25° 50′ to 26° 30′ N.) which belongs to these hereditary T'u-ssu, or chiefs.

The people are all Lissoo, but with a strong admixture of Chinese blood. The men dress in Chinese fashion, but the women, while adopting the Chinese cotton cloth, retain the petticoat and profuse decoration of head, bracelets, necklaces, and armlets, which is so characteristic of the true Lissoo garb. Few of them can speak any Chinese except the chiefs and their families. The people hardly go beyond their own villages, and seem to live quiet happy lives, only disturbed by the occasional difficulty of getting food, and by the trouble and petty exactions which attend the work of collecting the chief's tribute, or house-tax of half a tael per year. The usually peaceable condition of this portion of the valley is no doubt partly due to the general absence of interference by the Chinese mandarins, which is owing to the fact that the country is too poor to be worth squeezing. The chiefs have none of the machinery, and exercise none of the functions, of a regular government, except collecting their dues, in which they are assisted by a Chinese clerk. Each village seems to regulate its own affairs through its headman.

The country along the Salwin north of 25° 30′ is referred to by these people as "Han-ti," or Chinese territory; but the subjects of the chiefs also refer to themselves as "Han-jen," or Chinese, as opposed to the wild tribes farther north up the river, who both are, and are called, Lissoo. Between those so-called "Han-jen" and the wild Lissoo there exist much jealousy and bad feeling.

Even at Cheng-ka mules and ponies are rarely seen; beyond Cheng-ka a very few dogs, goats, and pigs, with an occasional fowl or skinny ox, are the only domestic creatures. Owing to the severe famine which raged in these districts in the season 1904–1905, very few even of those are left.

The upper Salwin as far as Cheng-ka had previously been visited by one European, namely, Mr. Litton; beyond, as far as 27° 30′ N., all was *terra incognita*.

Starting from Pei-pa on November 2, and passing through the

Cheng-ka paddy-fields, we descended by a rough track through uninhabited and almost uncultivated country to the ruined guard-house of No-li-ka (7 miles), and then a scramble through high grass and jungle brought us down to the mid-day halt at a sandy bay by the waters of the Salwin, which here flows at an altitude of 3400 feet; the altitude at the suspension bridge, lat. 25° N., is 2700 feet; a little south of lat. 27° N. it is 4000 feet; while at Kion-ra, in lat. 28° N., Père Genestier of Tsekou gives it as 4900 feet. In this section of its course the Salwin at low water varies from 90 to 130 yards in breadth, and is of great depth. There are no falls, but between 26° 15′ N. and 27° N. there are constant rapids, at some of which the river is contracted to 80 yards. The volume of water in the rains is enormous; we found unmistakable signs of the river having risen, in August, 1905, over 40 feet above its November level. In the fine season the water is intensely cold. From a point above 27° 30′ N. down to Teng-keng, the river is confined, not indeed between precipices, but between a series of steep ridges falling down in endless succession both from the Mekong and the Irawadi divides to the Salwin. In many places these ridges have a final sheer drop to the river of 500 to 1000 feet, so steep that it is impossible to pass along their base.

The upper Salwin in its course through North-Western Yunnan resembles the Mekong; firstly, in that its course is quite free from the great bends which characterize the Chin-sha, or upper Yang-tzŭ; secondly, in receiving no tributary beyond a few mountain torrents, the reason of this being, of course, the extreme narrowness of the Salwin basin. At lat. 26° 30′ N. an air-line of 18 miles would join the east and west limits of the basin, while in lat. 26° 50′ N. a line of 40 miles would span it and also the basin of the Mekong.

North of lat. 26° on the west or Irawadi side of the Salwin, the mountains are exceedingly precipitous, and come down in a series of fantastic, jagged ridges, divided by deep gutters. Altogether, our advance up the river was very slow; even the river-banks, at the few places where we were able to follow them, were encumbered with enormous boulders, piled together like Pelion upon Ossa, rendering progress most difficult. The basis of the rock formation of the upper Salwin is limestone, and the strata of the higher slopes are tipped up so as to point to the sky. There are other evidences of cataclysms and volcanic activity to be found in the boulders strewn along the banks, among which gneiss, marble, and quartz are to be found at every turn. It is said that the Salwin valley is the result of erosion. I think this improbable; but the geology of all this most interesting region demands a competent man of science to describe it.

Animal and bird life along the upper Salwin is conspicuous by its absence—an important matter for the traveller, who cannot count on replenishing his larder with game. On the other hand, the river-banks

at a low altitude, and where wholly sheltered from the north winds, have an almost tropical climate, and vegetable and insect life is both vigorous and troublesome. Creatures with inconveniently long legs plunge suddenly into one's soup; great caterpillars in splendid but poisonous uniforms of long and gaily coloured hairs arrive in one's blankets with the business-like air of a guest who means to stay. Ladybirds and other specimens of Coleoptera drop off the jungle down one's neck, whilst other undesirables insert themselves under one's nether garments. The light in the tent attracts a perfect army of creatures which creep, buzz, fly, crawl, and sting. Scissor insects make the day hideous with their strident call, and the proximity of Lissoo coolies introduces other strangers, of which *Pulex irritans* is by far the least noxious. The mere act of walking in this country is a work of much physical exertion. The villages under the Chinese chiefs have a laudable custom of cutting out their roads every year after getting in their harvest, but in the country north of Cheng-ka constant feuds between neighbouring villages prevent this useful work; the paths are narrow tracks choked with the luxuriant growth of the previous rains, slippery and lop-sided, and as often as not leading along the brink of a precipice. In some places we had to haul ourselves over boulders by pendant branches, or scramble along the face of cliffs by notches in the rocks, more suitable for monkeys, Lissoos, or other creatures gifted with more prehensile feet than a European.

Poisonous-looking scarlet fruits hang from the overarching jungle; lianas and tree-roots trip up the unwary traveller; if he catches the nearest plant to save himself, the chances are that it is a stinging nettle of the size of a laurel, and poisonous in proportion. In some places, especially around maize-fields, the natives provide a further diversion in the shape of "panji," or hard pieces of sharp-pointed bamboo, which are driven into the ground amongst the grass, and will, if trodden upon, pierce even through a leather boot and deep into the foot. It is only when the traveller, scratched, bruised, and with torn clothes, emerges on to a quiet sandbank by the river, or on to some open terrace high above it, and finds the camp fire lighted, the tents pitched, and a pailful of hot water ready for a bath, that he begins to think that exploring the Salwin is a game worth the candle.

But the scenery of the upper Salwin can never be forgotten by any one who has wondered at it in the rich sunshine which prevails after the autumn rains have given way to the first touch of winter. The great variety of rock formation, the abundant forests and vegetation, and the diversity of light effects between the summits of the ranges (at 10,000 to 13,000 feet) and the abyss in which the river flows produce a vast panorama of ever-changing beauty. In the morning the sun, as it touches the top of the Mekong divide, sends wide shafts of turquoise light down the side gullies to the river, which seems to be transformed

into silver. The pines along the top of the ridges stand out as if limned by the hand of a Japanese artist. In the evening all the wide slopes of the Mekong side are flooded with red and orange lights, which defy photography and would be the despair of a Turner. The traveller whose fortune it has been to explore the great rivers of this our north-east Indian frontier will admit that the Salwin, while it is inhospitable, difficult, and barbarous, far exceeds in natural beauty all the valleys of the sister rivers, the Yang-tzŭ, the Mekong, or the Irawadi.

Continuing our march from the sandbank below No-li-ka (7 miles from Pei-pa), we toiled up a steep slope to the terrace and village of Shih-chi-dé, 1500 feet above the river; here we had a good reception

BIRD'S-EYE VIEW OF TALIFU CITY, ALTITUDE 6500 FEET, TAKEN FROM THE LOWER SLOPES OF THE TALI SHAN OR TALI MOUNTAIN, ABOUT 1200 FEET ABOVE THE CITY LOOKING EAST.

from the Lissoo, deputations from several villages round about offering us small presents of eggs and rice. Every one seemed to know who Mr. Litton was, and it was evident that the fair treatment which the porters and others employed by the party during the spring had received had been passed along, and had had an excellent effect on the natives of the valley. From Shih-chi-dé northwards the people were clad in the Lissoo style, and few or none could speak Chinese.

On November 5 we continued at about 1500 feet above the river, with a series of limestone peaks to the west on the left of us. On clearing the top of a ridge to enter the gully of Mi-wo, we found ourselves confronted by a deputation of warriors armed with huge crossbows, and

headed by the local "ni pa" (prophet, or medicine man). He produced a paper scrawled over with rude imitations of Chinese characters, and declared that he had received instructions from heaven to go and kill somebody, and that he thought the headman of Cheng-ka was the most suitable person, but he desired our advice. We strongly recommended him to go home and see to the grinding of his maize crop.

Passing the village of Mi-wo in its narrow gully, we ascended open ground to the fields of Tu-mo. All along the road we met a number of warriors hastening to follow the prophet to Cheng-ka, but they were far from wishing to molest us; indeed, several of them left the war-path to escort us on our way, and, after seeing a twelve-shot repeating Winchester rifle fired, desired our alliance and assistance in the projected raid on Cheng-ka.

After leaving our bellicose friends at Tu-mo, we crossed another gully to Hsia-ku-dé, a large village for this country, consisting of some forty houses of the true Lissoo type, constructed of rough logs and bamboo matting, raised on piles, with one room only, and a tumble-down verandah. A stone hearth occupies the middle of the room or house, and round this the family eat and sleep. The headman of Hsia-ku-dé was a typical old Lissoo, tall and thin, with a close-shaven grey head, bleary eyes, an aquiline nose, huge earrings of silver and cornelian, and a profusion of bracelets and beads hung about his person and over his dirty hempen clothes. He explained to us his grievances against the Lao-wa chiefs, and gave us a present of eggs and honey. Some young men of the village gave up their expedition to Cheng-ka to join us in our journey up the river.

North of the open slopes of Hsia-ku-dé cliffs block progress by the river-bank. Bearing west of north away from the Salwin, we marched by an unusually good path past the village of Ta-wo-dé, where again the people turned out to offer presents, and, reaching the top of a rise at 6500 feet, we looked across a precipitous valley to the peak of Yako. This is a great tooth of limestone, 9400 feet high, rising sheer from the river-bank. It forms a conspicuous landmark as far off as Mao-chao. At its south base flows a considerable mountain stream, to which we had to descend by a breakneck track from Ta-wo-dé. The slopes of the descent were clad with masses of the trailing Crawfurdia referred to above.

We crossed the Yako stream at 4500 feet, a descent of 2000 feet from Ta-wo-dé, by a rickety bridge, consisting of a single undressed sapling thrown across, slung on strips of cane, with a banister of pieces of liana. Then a climb by a rude ladder up the face of a cliff brought us to the half-dozen houses which formed the village of Yako. This march was through country wild in the extreme, the lower slopes of the hills being covered with long grass, while above towered an immense

variety of limestone crags and peaks, rising up toward the Irawadi divide.

On November 7 we marched up from Yako village through a forest rich in orchids, and so over the Yako ridge (2 miles) by a pass 7500 feet high some 4 miles west of the Yako peak; from this point we eagerly scanned the country to the north, but it appeared even more difficult and mountainous than what we had traversed, and promised exceedingly slow progress. Just below, and to the north of the Yako pass, is an open horseshoe-shaped stretch of irrigated and cultivated land, about which is scattered the friendly village of Ma-pu-lai-dé. From the village we made another very steep descent through scrub to the wretched hamlet of Ta-cha-dé. Though the harvest had only recently been gathered in, nothing but a little Indian corn was to be bought at any of those villages.

Ta-cha-dé is the limit of the jurisdiction claimed by the Lao-wo chief, though, in point of fact, he has not for many years been able to gather any tribute north of Cheng-ka. While we called the midday halt at Ta-cha-dé, we asked the villagers concerning some new graves which we noticed in a field close by. They answered, "Our headman and two others were killed three months ago in a feud with a village higher up the hills." "Is it settled now?" "Yes." "Did you report the matter to Lao-wo?" "No. What would have been the use? We just settled the matter ourselves." "How?" "Oh, we killed eight of the other party."

Beyond Ta-cha-dé the path appeared to lead up a ridge even more precipitous than that of Yako; we therefore resolved to descend again to the river and try our fortune along its banks or in the bed; a rough track brought us steeply down to a good camp on a sandbank by the river at 3500 feet, 1400 feet below Ta-cha-dé, where a beautiful species of crinum bloomed in masses amongst the boulders, and lofty cliffs and jungly slopes sheltered us from the wind.

The next day's march was one long scramble along and over the piles of gigantic boulders which litter the river-bank and bed. Lofty cliffs shut out the river from view on both sides, and the river was here broken by a succession of foaming rapids. We did not meet a soul all day, and only noticed one small village on the opposite side of the river.

In the afternoon we made our way by a slippery and difficult path along a steep slope to an open meadow some 150 feet down the river, where five wretched huts constituted the village of Ku-tou-wa-dé. The inhabitants, a few women and youths, hid themselves on our approach, but soon became reassured, and told us that the adult male inhabitants had been exterminated by famine and feuds. Neither here nor at the main village higher up the hill was it possible to buy a pound of cereal food.

Ku-tou-wa-dé occupies an unusual site close to the river-bank and not high above it, because there is a single-rope bridge across the Salwin at this point. These single rope bridges of the upper Salwin are far more difficult to cross than the double ropes of the Mekong, by which the passenger always starts from a higher level than that at which he lands on the other side, and is thus rapidly carried across by his own weight and with little or no exertion. On a single-rope bridge, however, after having been trussed by cords on to a runner, it is necessary to haul one's self across hand over hand; as one is tied with face to the sky and back to the water, this is a difficult operation. As the Salwin ropes are made of very roughly twisted cane, there is always the chance that the whole affair will break in the middle, and the certainty in any case that one will arrive on the opposite side with hands full of painful splinters off the rope.

Since leaving Hsia-ku-dé we found that the country increased in wildness every march, and the inhabitants in squalor, poverty, and barbarism. Every village which we passed gave us terrifying accounts of the ferocity and savagery of the next, where we would infallibly have our throats cut, etc., etc. On the lower Salwin we had heard stories of people on the upper river who never attempted to wash, and who smeared their faces with grease and filth; this was perfectly true of the Ku-tou-wa-dé inhabitants and those to the north of that place.

The food question, however, was the most difficult for us to solve, and on November 9 we stopped at the considerable village of La-tou-wa-dé (4500 feet) to endeavour to raise supplies. Here all the people, men, women, and children, were dressed in hempen garments of pure Lissoo style; none of them spoke a word of Chinese or acknowledged any sort of Chinese or other authority. They had not even a headman of their own. They were, however, willing to trade, and suggested that Mr. Litton and I should barter our breeches for a bag of rice, but, as we had only one pair in serviceable condition, we could not accede; but a Chinese coolie who was with us did a deal with one of his ragged and lousy jackets, which he bartered for some maize and salt. Cloth was the object in greatest demand, but unluckily we had none to spare; therefore one skinny chicken, a few pounds of bad rice and maize, and two bamboo tubes full of honey, were all we could get from this village of thirty houses, and even this purchase upset the local market.

Beyond La-tou-wa-dé the country became wilder at every step. We were able to do a good long march of 11 miles, mostly along the river, here broken by many rapids, and under beetling cliffs to an opening in the mountains, where above some paddy fields is situated the picturesque village of Chong-wa. The few inhabitants fled at our approach, but we gradually coaxed some of the bolder spirits back to our camp; we found they had feuds with all their neighbours, and were afraid to guide us a mile in any direction, unless we were anxious to attempt a little-

frequented pass, which they declared led up from their village in three days' march to some friendly Lissoo villages on the other side of the Irawadi divide. Our chief object, however, was to reach a point farther north, whence it would be possible to get an extensive view further up the Salwin, and thus discover the general geographical features of the country. The river-bank was impassable on account of cliffs after Chong-wa; therefore, on November 11, we had to climb a steep ridge of 1200 feet, past the village of Ta-chua-ssŭ, where the

VIEW OF CITY OF TENG-YUEH, LOOKING WEST FROM THE INNER WALL ABOVE THE EAST GATE.

people at first took to their heels, but soon became reassured and offered us the welcome present of a fowl.

From the top of this ridge we continued our march through exceedingly wild country, without any cultivation, until, after 6 miles, we again reached the river-side for the midday halt, amid a tangled maze of grass and jungle plants. The vegetation in that part of the country is almost as great a nuisance as the insects. Every sort of seed attaches itself to one's person; some are provided with hooks, others

with natural gum, others pierce the skin or work down under one's socks. An hour's march leaves the traveller caked with the seeds of enough plants to form the material of a work on the methods of the natural dispersal of flora.

One afternoon of very difficult and even dangerous cliff-climbing brought us to a few wretched huts dignified by the name, as a village, of Niu-ku-ssŭ, and here we heard certain news of the existence of a rope bridge across the Salwin a few miles farther on.

Camping in a gully beyond Niu-ku-ssŭ, 9 miles from Chong-wa, for the night, early next day, November 12, we reached a flat marshy unhealthy plain by the river, covered with rank grass, poisonous creepers, and huge specimens of a shrubby species of Urtica. This plain, some 4 miles long, was closed to the north by the conspicuous hog's-back ridge of Ju-tu-lo, while to the west of it, on the hill slopes which rose up to the Irawadi divide, was another scattered village. It was an undesirable camp, but we found the single rope by which we could reach the other side. We decided to cross the whole party to the left bank, where, we were told, the villages were larger and more civilized, and that there were passes eastwards over to the Mekong. Luckily, we found a native of the important village of Lo-ma-di on the left bank, returning home from the right bank, and he at once volunteered, in consideration of a bead necklace, to fetch his comrades with the ropes and runners necessary for crossing our party, which consisted in all of thirty-five persons and a dog. Meanwhile the people of the village on the right bank, where we were camped, had heard of our arrival, and came down to see us, and a wild lot they were. It then appeared that there was a feud about this rope bridge between the two villages on the right and left banks respectively, each party claiming that the right and profit of assisting travellers across belonged to them alone. We offered to give an equal present to both parties, but when our friends from the left bank returned with the runners, we saw at once we were in for a serious disturbance. The right-bank party was led by a bullying savage, who shouted that the left-bank party should not help us across. The lefts had rashly left their arms on the other side, but proceeded to tie up one of our loads for the passage; whereupon the leader of the rights whipped out a poisoned arrow and shot it from his bow, over our heads, into the river —a sign, like Mr. Snodgrass taking off his coat, that he was about to begin. As we were all crowded together on a narrow path, near a tree to which the rope bridge was secured, and the bellicose Lissoo was about to draw his bow again with an arrow in it which might find a billet in the body of any of us, the situation was critical. Mr. Litton and I at once rushed him, and I fired several shots from my Winchester repeater over his head at a boulder on the other side of the river. The effect of seeing the bullets smash against the stone at such a distance

was immediate, and then, through our interpreters, we told the man and his friends that, if they made a show of stringing their bows again, the next bullet would find a resting-place in some of their carcases. They had little or no idea of firearms, especially of weapons of precision, and they at once subsided into an awe-struck silence; but still we had to stand on guard, and at intervals give exhibitions of our marksmanship and the power of our weapons, till all our party had been safely hauled across the rope to a sandbank on the opposite side,

NATIVE OF THE SALWIN VALLEY.

where we pitched camp together with our friends from Lo-ma-di, who expatiated on the savagery of the low people who lived on the right bank, congratulated us on the manner in which they had been suppressed, and promised us a hearty reception at their own village next day.

Early the next morning, November 13, we ascended steeply from the river through carefully cultivated patches of maize, millet, and buckwheat to 6500 feet, when we came on the elaborately terraced ricefields of Lo-ma-di. Our friends of the previous day and a number of their

friends were now with us, and, though all armed to the teeth, were most amiable and childishly delighted with our firearms, our clothes, and the pointer dog.

What was most interesting to us was an extensive view which we obtained from a small plateau in the midst of the paddy fields, looking straight north up the funnel-like valley of the Salwin. As far as the eye could reach, which was as far as lat. 27° 40′ N., we at the time being in about lat. 26° 55′ N., we could trace the almost direct north-and-south course of the river, and the succession of ridges falling down from the high ranges to the river from the east and west divides, in a manner so regular as to suggest the ribs of a vast skeleton. This view showed conclusively that there is no plain or open valley in this section of the Salwin, as was supposed, and that the character of the country for a long distance to the north of us was the same as that through which we had just passed.

From the paddy fields we ascended to the village of Lo-ma-di, by far the largest, cleanest, and best-built Lissoo village we had yet seen; some ninety households were scattered along a broad slope at an altitude of 6500 feet, looking down on the Salwin, more than 2000 feet below. Groves of pine and fruit trees gave grateful shade, and the little garden plots were divided by neat bamboo fences. The picturesque inhabitants, with their beads, cowries, silver ornaments, and long hempen garments, came out *en masse* to welcome us, and several of the village elders brought trays of rice, eggs, vegetables, etc., which they offered on their knees. We found several Chinese-Minchia traders from the Mekong; they bring cotton cloth, opium, salt, and goats, which they exchange for local produce, the staple being a varnish, produced by tapping a varnish tree similar to one which Mr. Litton says is well known in the province of Kwei-chou. Beeswax, some drugs, and a small supply of golddust are also exchanged. Trade with the Lissoo, we were told, is a profitable but risky matter, as there is no sort of government in the country, and even the comparatively civilized tribes on the left bank of the Salwin are continuously fighting amongst themselves.

The attentions of the crowd at Lo-ma-di became so embarrassing that we resolved to push on into the mountains. Marching south-east by an excellent path through oak scrub, we halted for the midday meal at the hamlet of Ji-Ji, situated at 7200 feet on an open shoulder of a wide ridge commanding extensive views down the mountain ranges to the south.

The men of Ji-Ji were at war with their neighbours, and, indeed, we watched the progress of the fight during our tiffin. The *causa teterrima* was the theft of some "pao-ku," *i.e.* maize, and a whole army corps, consisting of some fifty warriors, had been mobilized. These fellows, with their grotesque ornaments of silver, deers' horns, pebbles, and cowries, their blackened faces, their flowing hempen robes, their war-bows 5 feet

long, their war-swords 5 feet long, and their broad ox-hide shields 5 feet high, moving in a line beyond their village, presented an image of the "pomp and pride and circumstance" of war. The enemy occupied a position higher up on the hill, and a fierce bombardment of opprobrious epithets was maintained, but neither side got further than swearing and stringing bows until the time arrived for the afternoon meal, when the combatants dispersed to their respective homes, from which we judged their wars resembled those of Tweedledum and Tweedledee, "who felt that they must fight for half an hour, and then have tea."

Ji-Ji was the last village on the path leading up to Mekong-Salwin

GROUP OF MING-KWONG LISSOO, OF THE VILLAGE OF TA-CHU-PA.

divide, which we now determined to cross. On the evening of November 13, we made good way into the mountains, marching along an easy but narrow path through woods, high above a feeder of the Salwin. We met some more traders driving goats down to Lo-ma-di, and we bought the flower of the flock for our dinner at Tls.1.50. Camp was pitched 4 miles from the Salwin, under a large rock overhanging the path, which gave the men some shelter from the damp of the forest, and early the next day we negotiated the pass, November 14.

Crossing the head of the stream above which we had marched the day before, a long and steep but not difficult ascent, through bamboo brake and pines, brought us out on to an open alp at 10,500 feet. Hence a climb by a rocky path brought us up on to a bare wind-swept

col, which forms the pass at 12,500 feet, 9 miles from camp, 20 miles from the Salwin. Unluckily, mist was being blown along the ridge, and this obscured our view, but several bare limestone peaks were seen, rising 1000 to 2000 feet above the pass. The men were all benumbed by the intense cold, and at the first sheltered spot, some 500 feet below the summit, we lit a roaring fire of bamboos, and enjoyed, so far as the drifting mist allowed us, an immense view of the Lichiang and Tali prefectures beyond the Mekong. In the afternoon we got on to a convenient but steep spur, and made rapid progress down towards the Mekong; we camped in a wood at 9400 feet, near the village of Hou-tzŭ-ngai (Monkey cliff), after a march of 15 miles. The next day we rested the men at a pleasant camp under pines, near the little village of twenty log huts. We were over 5000 feet above the Mekong, and in latitude 26° 55′ N., some 20 to 25 miles north of the Chinese market of Ying-pan on the left or east bank of the river. This is a salt bazaar, and the centre for all the petty trade between the Minchia inhabitants of the Mekong and the wild Lissoo. It would, we thought, be a good place for us to replenish our exhausted commissariat.

From Hou-tzŭ-ngai we therefore turned south, and found an excellent high-level road, by which, on the afternoon of November 16, after a 25 miles' march, we found ourselves at the mud-built Minchia village of Pu-mu-tou, 7500 feet, from which Ying-pan bazaar could be seen across the river far below us.

The people of Pu-mu-tou, at first apprehensive that we had something to do with the Yamen, soon became friendly, and brought fowls, eggs, and a pig for sale. Some of our Lissoo porters were sent down to the market next day, while we, having observed some paddy fields, varied with patches of scrub, which foreshadowed *Phasianus elegans*, went out to forage with the guns, and secured a welcome addition to our larder of six brace of fine pheasants. Our men came back in the evening not more than reasonably drunk, and laden with supplies. We were therefore in a position again to face the terrors of the foodless Salwin, and the headman of Pu-mu-tou volunteered to guide us up to the divide by a different pass from that by which we had come, on condition that we would not expect him to approach any of the villages of those terrible wild Lissoo.

This part of the upper Mekong differs widely from the Salwin valley in the same latitude. Instead of sharp crags and cliffs of limestone, dense semi-tropical jungles, extensive forests, and wild Lissoos with their poisoned arrows, we viewed a peaceful scene of wide, bare, cultivated slopes of clay or disintegrated sandstone, shelving down in terraces to the river below. The basin of the Mekong at this point is twice the breadth of the Salwin, though the altitude of the latter river is 1000 feet less. The people, like the scenery, are altogether less wild than on the Salwin. The houses of mud brick are built into

village streets, instead of being scattered about over the hillside. Large villages of fifty to a hundred houses occupy all the good sites, where water for rice irrigation is available. In customs, dress, mode of life, in fact, in everything but in language and race, the Minchia are, to all intents and purposes, Chinese. They are too far off from their "father and mother," the Lichiang official, to be troubled much by Yamen underlings, Lichiang being distant eight long mountain stages. They live, if not a strenuous, at least a peaceful and not unprosperous, life, and, being far more industrious in cultivation, and less troubled with clan fights than the Lissoos, are less frequently subject to the ravages of famine.

From Pu-mu-tou we ascended a spur, through oak scrub and over grassy slopes, rising in the day's march from 7400 feet to 10,500 feet on the slope towards the Salwin divide. At this altitude there was a superb view of all the great ranges of north-western Yunnan east of the Mekong, from Talifu to the borders of Tibet. Most of these north-western Yunnan panoramas are dominated by the glittering snow-mountain of Lichiang; and from the altitude we had reached, Mr. Litton saw, for the first time, the peak which I described to him after my return from my journey down the Chung-tien plateau. He estimated the height as being very near what I put it down as, 22,000 feet. It forms the end of that part of the Lichiang range which extends up the eastern side of the plateau to the north of the Yang-tzŭ river. It is unknown and unmapped.

After an intensely cold night on the mountain-side at 10,500 feet, we proceeded, on November 19, up the pass, which for the first time was traversed by European feet. The path, after topping a spur, lay through pine woods deep in snow, and then over a frozen black marsh surrounded by tall sombre firs, whose dark green foliage stood out against the snowy slopes of the pass and the deep blue sky above. Then an ascent through rhododendron scrub, and over a bare down, where we passed a number of wild Lissoo going down to the Mekong to barter for salt, brought us to the summit of the pass, 12,300 feet.

Here a surprise awaited us, for the view to the west was perfectly clear, and the whole of the great Salwin-Irawadi divide was spread out before us. From a little below the pass this range could be followed to the north as far as the eye could reach, until, at a distance of about 100 miles from where we stood, and in approximate lat. 28° 30′ N., it was merged in a huge range of dazzling snow-peaks, trending westwards. This range is doubtless the east source of the Irawadi, and forms the divide between it and the Zayal, the Bramaputra system. The upper slopes of the Salwin-Irawadi divide, which we saw spread out before us, resemble a vast wall. The trend of the range is most regular from north to south, and there are no very conspicuous peaks. The average height of the summits in this latitude, 26° 55′ N., would be

probably 12,500 to 13,000 feet. There was practically no snow on it in November.

Below the wall-like ridge which forms the backbone of the range, limestone spurs, crags, and precipices in bewildering confusion fall down to the Salwin. It was easy to see why the upper slopes of the range are uninhabited, and why this mountain barrier is an ethnographical boundary between the Lissoo and Kachin races.

On this pass, as at many other places on our journey, we saw several mouldering skeletons by the sides of the pathways, victims either of the famine of the previous season, or of a savage temper and a cross-bow. The Lissoo have a superstitious terror of human remains, and give them a wide berth. In the afternoon, after crossing the pass, we made good way along the top of a well-defined winding spur which rose up from the Salwin. Descending to 8600 feet, we camped at the small Lissoo village of Lu-po, from which place the pass derives its name, after a march of 15 miles. At Lu-po the people gave us alarming news—there had been fighting down the river; 3000 Chinese troops had come from Cheng-ka and slaughtered the Lissoo; one man had seen with his own eyes fifty corpses laid out by the Salwin; all the ropes across the river were cut, and so on, and so on. The next day, November 20, when, by a breakneck descent on a slippery declivity, we reached the Salwin at 7000 feet, near the village of U-a-lo, we found that three of its enterprising inhabitants had just made a rude raft of bamboos, loosely tied together, and were prepared to take our party across. As the *ship* could only carry two men and two loads in a journey, and as the Lissoo do not shine as watermen, while the current at this point is strong, the crossing was not completed by nightfall. By the camp fire the natives made our flesh creep with further accounts of sanguinary battles down the river. When, however, we found on the next day that the rope bridge at our old camp of Ku-tou-wa-dé was just as we had left it, we rightly attributed the 3000 soldiers to Lissoo imagination. What was more alarming was the serious inroads of fever among our little party, exhausted by the labours of a flying march; two very bad cases had to be carried on the backs of two of our coolies, and our stock of drugs was soon exhausted. Luckily, we got through without the loss of a single life, and by forced marches returned to the base camp near Lu-chang on December 1, in good spirits, if in ragged clothes.

We ultimately discovered the truth of the disorders at Cheng-ka. It appeared that our friend the prophet at Mi-wo, whom we had met on the warpath on our way up the Salwin, had not taken our advice to go home and pound his maize. A number of the young men of Mi-wo, Hsia-ku-dé, and the surrounding villages, some of whom had escorted us and endeavoured to inveigle us into an entangling alliance, finding "in these hot days the mad blood stirring," had raided the

Cheng-ka paddy plains, with a view of capturing the Sawbwa's uncle, who, however, escaped in time across the Salwin. The raiders thereupon speared one of his poor relatives, and—a far more serious offence—broke into the princely piggeries and did bloody execution on the porkers therein. They then camped and celebrated a Homeric feast. The Lao-wo chief, hearing of the horrid disaster which had befallen his uncle's pigs, hastened across the Salwin, and the neighbouring headman of Lu-k'u and Mao-chao also came to the rescue. It appears that the raiders were caught drunk, and three or four killed, while the rest dispersed. Finally, the unusually energetic Yung Lung official (sub-prefect) from beyond the Mekong, seven mountainous stages

VILLAGE OF TA-CHU-PA IN THE MING-KWONG VALLEY.

distant, hurried on the scene with a dozen men, the nucleus of the 3000 of whom we had heard, and took up a defensive position at Cheng-ka. The news of this so alarmed the Hsia-ku-dé and Mi-wo folks that they deserted their villages and fled north into the mountains, while the Cheng-ka people showed equal alacrity in running away in a southerly direction. Thus, when we reached Cheng-ka, we found the genial Yung Lung mandarin and his attendant chiefs in sole possession of the stricken field.

Similar disturbances have been of frequent occurrence, and are due to the squeezing attempted by Lao-wo on the Mi-wo and Hsiâ-ku-ti group of villages, which Lao-wo claims, but which do not recognize his authority. Lao-wo endeavoured to levy double tribute from Hsia-

ku-dé, whereupon the Hsia-ku-dé headman lifted twelve of Lao-wo's cattle. Lao-wo retaliated by kidnapping the headman's son and seizing his salt. Then the prophet began hearing noises, and even a prophetess appeared near Hsia-ku-dé. We ourselves had dealings with this dirty Cassandra; she conferred on us a small pig and a charm, in return for eight two-anna pieces and a silver bangle. Thus the trouble grew, after the usual manner of a frontier case where there are no British officers to settle it.

Before returning from Cheng-ka to Teng-yueh, we had, on November 26, moved camp to 9200 feet, up a grassy ridge above Pei-pa village, with the view of exploring a pass which leads over the Irawadi divide at this point. From our camp above Pei-pa we toiled up some steep slopes, which were clothed with large patches of virgin forest and bamboo brake, varied by grassy downs.

On reaching 11,000 feet, we saw before us the bare wall of limestone crags which forms the Irawadi divide, but, as usual in the complicated formation of this range, the ridge up which we had climbed did not go straight to the top, but turned off in a northerly direction, being cut off by a stream from the main range. The track followed a line parallel to the divide; it was a mere goat-path, and very difficult in places where it crossed some slippery cliffs. After a long march of five and a half hours from camp, or eight and a half from Pei-pa, we plunged into a pine forest, thence into a bamboo brake, and crossed the stream which divided us from the final arête, a stony upland leading to a col of 13,000 feet between two lofty crags of limestone. This pass above Pei-pa is uninhabited, and only used by a few scattered Lissoo householders living on the upper part of the Irawadi slope, and occasionally by salt porters. It is too wild and difficult to be a regular line of communication even for a coolie traffic. It is called the Chi-mi-li pass.

Having concluded this final bit of exploration, we returned without mishap to Teng-yueh, which we reached on December 13.

Remarks on the Lissoo Tribe of the Upper Salwin.

The Lissoo race, if not powerful or very numerous, occupies a large tract of territory. The tribe is undoubtedly an offshoot from the south-east of Tibet, probably an ancient offshoot established along the upper Salwin and upper Mekong before the introduction of Buddhism into Tibet. None of the Lissoo, even those who live among or near Tibetans, show the least trace of Buddhist influence or belief. Mr. Litton says their religious practices closely resemble those of the Kachins, who believe in numerous "nats" or spirits which cause various calamities, such as sickness, failure of crops, etc., unless propitiated in the most suitable manner. The most important spirit is the ancestral ghost. Lissoo graves are generally in the fields near the villages; over them is put the crossbow, rice-bags, and other articles used by the deceased. It

is probably from foundations such as these that the fabric of Chinese ancestor worship was constructed. Food is also placed on the grave for many days. The upper part of the structure is a roughly hewn board, of the shape, but larger than, a coffin-lid, to protect the articles hanging on the upright post from the weather.

The Lissoo are believed to be allied to the Lo-lo tribes which inhabit Yunnan and part of Sechuen. A Tibetan origin is assigned both to the Lo-lo and the Lissoo; and in their tall bony physique, high cheek-bones, and sepia colour, the two tribes certainly resemble one another. There is also a striking similarity in the languages, which can hardly be accounted for save on the theory of common race.

The Lissoo may be said to form practically the whole population of the Salwin valley from 27° 30′ to 26° N. They have spread in considerable numbers along the mountains between the Shweli and the Irawadi, and in isolated groups far away down the Burmese frontier, and, I am told, into the Shan States. They occupy the upper slopes of the Salwin-Mekong and Mekong-Yang-tzŭ divides in the Wei-hsi-ting district, and are found sporadically even to the east of Lichiang fu. Under British rule they have been found readily amenable to civilization, and are more docile than the Kachins. But those whom we saw on the upper Salwin north of Hsia-ku-dé were utter savages. Up to and including Cheng-ka in lat. 26° 12′ N., the Lissoo who are nominally controlled by Chinese chiefs are quiet and friendly enough. Then there is the Hsia-ku-dé group of villages under their headman, but not recognizing any Chinese authority, and resisting any attempt of the Chinese chiefs to exercise it. From Yako northwards up to the limits of the Lissoo country, about 27° 35′ N., there is no sort of government or control of any sort or kind, by any Chinese or other chief. Most of the villages have not even a regular headman; nearly every village, too, speaks a dialect, and two Lissoo sepoys from the Burmese frontier below Teng-yueh, whom we had with us, could not make themselves understood beyond lat. 26° 30′ N. There are also a number of tribal subdivisions, a source of constant feuds. The Chinese official theory that the country belongs to the hereditary Minchia chief Lo, who resides at Tu-wo, lat. 26° 8′ N. on the Mekong, has no foundation whatever; in fact, on the contrary, no sort of official person would dare to go anywhere near the country.

The villages are nearly all at war with one another; few of the people have ever in their lives been more than a day's journey from their own huts; suspicion, rumour, and terror sit enthroned among those limestone ridges. It is almost impossible to get a guide, and quite impossible to get any accurate information about routes, distances, and such-like details. None of those wild Lissoo ever seem to have asked whence the river Salwin, which occupies so large a place in their lives, comes or whither it goes, or what is at the back of the great

ranges which confine their view of the world. The object of each little community seems to be to keep its neighbours at a distance. The people are also exceedingly lazy; in the spring they do a few days' work in scraping a patch of soil, just large enough to yield subsistence, and in planting their maize; then in early October they put in a few days' more work, getting in their crop and cutting their hemp, or looking after their tobacco patch. All the rest of their lives is spent in eating, sleeping, and squatting round the hearth, varied by a rare expedition to get wood for a crossbow, poison for their arrows, or a stock of salt or wild honey. Under these conditions it is not surprising that, in spite of the sparseness of the population and the great extent of land suitable for maize and other cultivation, famine is of frequent occurrence.

Rice is a luxury; coarsely ground maize, buckwheat, and wild honey are the staple food of the people. When we passed along there were practically no domestic animals or fowls, as they had all been killed during the famine of the previous season. Wild honey as a change is an agreeable sweetmeat, but after a few days' constantly partaking of it, the European palate rejects it as nauseous and almost disgusting; it has escaped the Biblical commentators that one of the principal hardships which John the Baptist must have undergone was his diet of wild honey.

A draughty hut of rickety logs and bamboo matting, consisting of one room, in length 15 to 20 feet, and in breadth 6 to 8 feet, the whole raised 3 to 4 feet above the ground on piles, and provided with a verandah, and a stone hearth in the middle of the floor—such is the true Lissoo hut. The roof is thatched with grass. A large iron pot, a few wooden bins or bamboo baskets to hold grain, and some bamboo tubes to hold water, with occasionally a few rude stools and a rude loom for weaving their hempen garments—such is the furniture which supplies the Lissoo in his simple life.

If I had to suggest a title for a book on the upper Salwin I should call it "The Land of the Crossbow," which is the characteristic weapon of the country and the Lissoo tribe. Every Lissoo with any pretensions to *chic* possesses at least two of these weapons—one for everyday use in hunting, the other for war. The little children play with miniature crossbows. The men never leave their huts for any purpose whatever without their crossbows; when they go to sleep the "nu-kung" is hung over their heads, and when they die it is hung over their graves. The largest crossbows have a span of fully 5 feet, and require a pull of fully 35 lbs. to string them. The bow is made of a species of wild mulberry of great toughness and flexibility; the stock, some 4 feet long in the war-bows, is usually of wild plum wood; the string is of plaited hemp and the trigger of bone. The arrow, of 16 to 18 inches, is of split bamboo, about four times the thickness of an ordinary knitting-kneedle,

hardened and pointed; the actual point is bare for a quarter to one-third of an inch, then for fully an inch the arrow is stripped to half its thickness, and on this portion the poison is placed. The poison used is invariably a decoction expressed from the tubers of a species of aconitum, which grows on those ranges at an altitude of 8000 to 10,000 feet. The poison is mixed with resin, or some vegetable gum, to the consistency of putty, and is then smeared on the notched point. The "feather" is supplied by a strip of bamboo leaf folded into a triangular form and tied in a notch at the end of the arrow with the point of the angle outwards. The reduction in thickness of the arrow where the poison is placed causes the point to break off in the body of any one whom it

PANORAMIC VIEW OF THE LICHIANG RANGE, TAKEN FROM THE LOWER SLOPES OF THE EASTERN FLANK LOOKING WEST, ALTITUDE 11,000–12,000 FEET.

strikes, and as each carries enough poison to kill a cart-horse, a wound is invariably fatal. Free and immediate incision is the usual remedy when wounded on a limb or fleshy part of the body; but at Cheng-ka the uncle of the Lao-wo chief showed us a preparation which resembled opium dross, and which he said was an effective antidote. Its nature and preparation is a secret known only to the "prophets." We saw one man at Cheng-ka who had been wounded through the fleshy part of the arm in the recent fighting, and through the use of the remedy had quite recovered, but in its passage the head of the arrow had not broken off.

The marvellous Chinese stories which one hears about the Lissoo

have to be taken with a good deal of salt. The Lissoo are not a fighting people, and, with few exceptions, seemed to us to be arrant cowards, but the crossbow and poisoned arrow is certainly a most diabolical weapon. An arrow from a war-bow will pierce a deal board an inch thick at 70 to 80 yards; some of the Tsekou natives (my servants in the Mekong valley in 1904–5) were so expert that they could hit a mark, 4 inches in diameter, repeatedly at 60 to 80 yards. As no one goes anywhere without his crossbow and his bearskin quiver full of those poisoned arrows, and as every village is at feud with every other, mutual suspicion, of a nature to absolutely prevent social intercourse, is inevitable. In open fight the Lissoo are usually careful to keep at a respectable distance from each other and behind ox-hide shields, which protect the whole of the body. But if battle is rare, murder and sudden death by ambush in the jungle are common. The Lissoo has all the lack of self-control which marks the savage, and it is so easy to bend down, string a bow, and send an arrow into any one with whom one has a difference of opinion. I can recommend any traveller who falls in with a tipsy or bellicose Lissoo with a crossbow, to shoot first and argue afterwards. The first step in civilizing these people would be to deprive them of their horrible machines.

The wild Lissoo are much addicted to strong drink; they make a fermented, not a distilled liquor out of millet or maize, which resembles strong Japanese *saké*. They are so improvident that they commonly use for wine grain which is required for food.

There is no regular communication up and down the Salwin. A few petty traders go from Cheng-ka to the villages near; others, greatly daring, go from Ying-pan-kai, on the Mekong, westwards into the wild country along the Salwin. Further north from A-wa, lat. 27° 20′ N., on the right bank of the Mekong, and from the Ha-lo ferry on the Mekong near A-wa, an important pass leads over to the Salwin, which it strikes at about lat. 27° 35′ N., at a village called Ta-su. This country is mainly inhabited by Lu-tzu, a tribe quite distinct from the Lissoo, and probably connected with the Mishmi or Kachin races. From La-tsa, lat. 27° 36′ N., northwards for some distance, the Salwin valley is far opener than in the wild Lissoo section, part of which we explored. La-tsa is also the southern limit of the somewhat vague authority exercised or claimed by the Yeh-chih chief on the Mekong. Chinese agents of a trading firm at A-wa and Wei-hsi-ting are already established at La-tsa and Ta-su, which they make a base for petty trading ventures westwards into the upper Irawadi basin, the Ch'in country.

As regards the wild Lissoo, we were able to lift a corner of the curtain which has hidden them hitherto from the outer world, and I think they may in future be safely left to enjoy, in obscurity, their dirt, their fever, their limestone ridges, their poisoned arrows, and their wild honey.

Before the paper, the President said: The paper which is to be read to-night deals with the only portion of the Salwin river which remained untraversed by Europeans when, in December, 1905, Mr. Litton and Mr. Forrest set out on their expedition. Mr. Litton on his return to England died, and that is the sad reason why we are not on this occasion able to congratulate him on this expedition, and on his previous expedition in Yunnan and Burma. Unfortunately, also, Mr. Forrest is absent, though not, I am glad to say, for reasons of ill health. In these circumstances, our honorary secretary, Major Close, has very kindly consented to read the paper, and I will therefore ask him, without more ado, to be kind enough to proceed with the reading.

After the paper, the President: This paper deals with such a very out-of-the-way place, and Major Close seems to be the only person present who has ever visited the Salwin. It is, therefore, somewhat difficult to get up a discussion. I believe that every great river throughout the world is now more or less known, and that the Salwin was the last great problem that had to be solved. It is one of the sad things about exploration of this sort that it destroys that fascinating pleasure that geographers had of attempting to fill up the great blank places on our map, by tracing the courses of rivers across them, and I think we forget sometimes how short a time ago it is since the last of these problems had to be solved; for it was not known until the year 1885 whether the upper waters of the Brahmaputra fell into the Brahmaputra or into the Irawadi, and that, of course, was a very primary problem in the geography of this district. This problem was set at rest by the traveller A. K. in 1885, although it ought to have been solved long ago by the explorations of the Abbé Kircher, the accounts of whose travels had been overlooked and forgotten for many years. In 1885 it still remained doubtful whether the Loo river in Tibet emptied its waters into the Salwin, and it is only twenty-one years ago since your President from this chair maintained the mistaken hypothesis that this Loo river emptied itself into the Irawadi. That problem was completely solved in 1896 by the explorations of Prince Henry of Orleans, and I am very glad to be able to mention the name of that distinguished French geographer in the presence of a number of distinguished French geographers who are here present to-night. Prince Henry of Orleans passed the Salwin river in one or two places, but between about 26° and 28° N. lat. there was a considerable portion of the river which he had not traversed. The paper we have heard to-night fills up this gap, and we may say now that the whole course of this river is fairly well known. I cannot help regretting the absence of Mr. Forrest, because I think there are one or two points on which he might have enlightened us in an interesting way. He speaks of seeing mountains as some 22,000 feet high, and I cannot help thinking this points to some considerable want of geographical knowledge on our part, and to some further field of research of a very interesting character. Then, again, he speaks of the bed of the Salwin river as not having been excavated by denudation. While this extraordinary arrangement of rivers running parallel to each other in narrow valleys for so many miles does appear to be due to some general cause affecting the surface of the Earth, I have no doubt each valley must have been excavated by denudation. This opens out a very large geographical or geological problem, and one which is worthy of study. Apparently the Salwin river is deeper than either of the rivers on either side of it. Well, this, so far as I see, points to the effect of denudation, and therefore to the basin of the Salwin being longer than the basins of either of the other two rivers. This fact ought to have solved the problem as to the Loo river being really the upper waters of the Salwin, because, the river being deeper, it would point to this being the most important river of the three. I think it is likely to be one of the last regions of the world to

be civilized. One can hardly conceive railways or roads traversing these regions from east to west, and the lines north and south along these rivers are not the natural routes for trade, and therefore there seems no reason why this country ever should be opened up. We are looking on scenes which are likely to remain the same for many, many years to come. I think you will like me, in your name, to convey to Mr. Forrest the thanks of the Society for the paper he has read to us.

RECENT EXPLORATION IN BRITISH NEW GUINEA.*

I. JOURNEYS OF MESSRS. BARTON, STRONG, MONCKTON, AND OTHERS.

The work of British officials in the Territory of Papua, as the British portion of New Guinea is now formally designated, continues to add to our knowledge of the geography of the great island, the broad outlines of which, so far as the narrower eastern extremity is concerned, may now be said to be fairly well ascertained. Accounts of many of their journeys have appeared in the "Annual Reports" issued officially in Australia, and have been referred to from time to time in the *Journal*, though the cartographical results have not always been made generally accessible. In the present number we are enabled to give a map embodying the most important of those results, so far as they relate to the east central parts of the territory, with which most of the recent survey work has been concerned. Among the officers who have been most active in this direction are the present administrator, Capt. F. R. Barton, Mr. C. A. W. Monckton, and Dr. Strong, who have kindly placed their maps at our disposal, while some additional information has been utilised from other sources.

Captain Barton has had many opportunities for survey work during his official connection with the territory, which has now lasted some years. As private secretary to the former administrator, Sir G. R. Le Hunte; as commandant, for a time, of the Armed Native Constabulary; and subsequently as resident magistrate of the Central Division, he made many journeys into the interior, and always paid careful attention to the mapping of the routes. In 1900 he made an important journey, in company with Dr. Blayney, Sir F. Winter, and others, from Cheshunt bay in the south, across the main watershed of eastern New Guinea to the headwaters of the Musa river, which had not then been reached from the northern side.† The country traversed was pacified, and a geographical result was the demonstration that the headstreams of the Musa reach within a comparatively short distance of the south coast, one of them, the Adana, breaking through the high range between

* Map, p. 328.

† Annual Report, 1900–01, Appendix H (with map); and *Journal*, vol. 19, p. 95.

Mounts Suckling and Clarence by a deep and narrow valley. A little later, Capt. Barton accompanied Mr. Monckton, then the resident magistrate of the North-eastern Division, on an expedition from Collingwood bay to the upper and middle course of the Musa, across a spur of the imposing Gorupu range, which runs north-east from Mount Suckling.* This was known as the Doriri Expedition, one of its objects being the pacification of the interior region inhabited by tribes grouped under that name.

Since his appointment as Administrator in 1904, Capt. Barton has continued to do good service to geography during his various visits of inspection to outlying parts of the territory. In September, 1904, he traversed the Northern Division in company with Mr. Monckton, by the newly-made road from Buna to the Upper Yodda gold-field, and thence to the station at Tamata (since moved to Ioma), in the lower Mambare valley.† In December, 1904, he undertook an inland expedition from Port Moresby to the Yodda valley, by way of the "Gap" in the main range just south of 9° S., being met here, by arrangement, by another party of police from the north.‡ The country traversed had not been visited for some years, and the expedition led to valuable results, both from the geographical and administrative points of view, government influence being established over the wild tribes in this direction, and regular communication opened from Port Moresby to the Yodda valley.

As resident magistrate, first of the North-eastern, and afterwards of the Northern Division (and, for a time, of the two together), Mr. Monckton has perhaps covered more ground in his many exploratory journeys than any other official, and it is largely to his labours that our improved knowledge of the interior of those divisions is due. His expedition in April, 1901, to the Doriri country, in conjunction with Captain Barton, has already been referred to. Later on he visited the remarkable tribe of swamp-dwellers—the Agaiambo—inhabiting a tract to the south of Dyke Acland bay. In February, 1903, he was placed in charge of an expedition for the examination of the country along the northern slopes of the Hydrographer's range, with a view to selecting a direct line for a road from the north-east coast to the Yodda gold-field. In this he was accompanied by Mr. Tooth, a professional surveyor. Later in the year he escorted Mr. Christopher Robinson, then Acting Administrator, on a difficult journey from Ketakerua bay (an inlet of Dyke Acland bay) to the Yodda valley.§ During this journey, which led through unknown parts of the Hydrographer's range, some hostilities with the natives occurred, and an outbreak of measles among the carriers added to the difficulties. After reaching Papangi in the

* Annual Report, 1900–01, App. N (with map); and *Journal*, vol. 21, p. 558.
† Annual Report, 1904–05, p. 4; and *Journal*, vol. 29, p. 91.
‡ Annual Report, 1904–05, p. 7; and *Journal*, *ibid.*
§ Annual Reports, 1902–03, p. 14; 1903–04, pp. 7, 45.

upper Kumusi valley,* it was found impossible to proceed, and the party returned to the coast *viâ* the Kumusi. Mr. Monckton seems to have continued his explorations in this region in 1904 and 1905, but the accounts of exploratory work have become more scanty in the later Annual Reports, and no detailed narrative of the various journeys appears to have been printed.

A still more important journey, carried out by Mr. Monckton early in 1906 from Ioma on the Tamata creek to Mount Albert Edward in the main range, is, however, described in the Annual Report for 1905–06 (pp. 85–93, with maps and sketches). The expedition was accompanied by Mr. Money of the Anglican Mission, who gave valuable aid in sketching the physical features of the country, taking photographs, and collecting vocabularies. The route led through a previously unvisited tract beyond the Aikora, the chief headstream of the Gira river, towards which, however, the miners have lately been pushing forward their camps. In the neighbourhood of a camp formed by Messrs. Bruce and Ericksen (who have attained some success in working a terrace claim, and whose treatment of their employés is spoken of in terms of high commendation) small caves full of stalactites and stalagmites had been disclosed, and a number of animals or reptiles, said to resemble lizards with hairy skins, had been washed out. Here the Aikora was about 2000 feet above sea-level, full of rapids and running through steep gorges. Being anxious to visit the Gagara and Kambisa tribes on the Chirima river (a tributary of the Mambare), Mr. Monckton crossed the dividing range, over 9000 feet high. Having reached the villages on the Chirima, he was obliged to send part of his force back for rice, and during his halt spent an anxious time on account of the hostile attitude of the natives. Some interesting information was, however, collected respecting these people and the objects in use among them. Continuing his march up the Chirima valley, Mr. Monckton, on May 5, began the ascent towards Mount Albert Edward by a spur running north of west, and leading to the point where the Wharton chain joins the former mountain. During the ascent the natives suffered severely from cold, and matters were made worse by want of water, but a scanty supply permitted some pea-soup to be served out, which, with chocolate, Mr. Monckton found of much use in similar situations. On the 6th, the track led through grass, mountain bamboo, and cane, until it emerged on to the summit of the Wharton chain, from which an excellent view was obtained. The whole of the forest on the summit had been killed by fire, and gaunt dead trees stood up for miles around. The carriers now suffered much from the rarity of the atmosphere, and camp was pitched at a height of 10,877 feet. Dense fog and rain delayed

* The Upper Kumusi had been visited in 1901 by Mr. A. L. Walker (Annual Report, 1900–1901, Appendix L, with map).

the party for a day, but on the 8th they proceeded over open grass and heather, with some moss and numerous creeks, and on the 9th reached a camp close to the central peak of Mount Albert Edward, at a height of 12,524 feet. A shallow depression running behind the "Column" visible from Ioma was studded with lakes, the waters of which flow both east and west, their outfalls being visible from Ioma as white patches on the mountain.

During the stay on the mountain the time was spent in taking bearings and photographs, and in a study of its natural productions. Traces were seen both of a graminivorous cloven-footed animal, and of a fair-sized carnivorous animal (probably a wild dog), but no specimen could be obtained, though some pigs were seen by a private of the police force, and regarded with superstitious awe as "devil pigs." Mr. Monckton calls attention to the fact that Sir W. Macgregor, in his report of the Mount Scratchley expedition, mentions that a "long-snouted animal" was seen. The whole of the summit of the range seems to be a hunting ground of the natives, and their tracks and fresh remains of fires were noticed. Much fog and cold rain was experienced, and on the night of May 14–15 the water in the washing basins and pools was frozen. A visit paid to the "Column" involved very rough climbing, which knocked up Mr. Monckton, whose health had suffered a good deal from the fatigues of the journey. It is a pinnacle about 60 feet high, with a diameter of about 20, and a rock-terrace extends some 200 yards from it towards the north. On May 20 the highest peak was climbed, two beautiful deep blue lakes being found near the summit, and bearings were taken of Mounts Victoria, Victory, Trafalgar, Lamington, and many others. The height by boiling-point thermometer (temperature 48° Fahr.) was found to be 13,230 feet, or 30 feet higher than that assigned by Sir W. Macgregor to Mount Victoria; Mount Albert Edward may therefore prove to be the highest mountain in British New Guinea.

Among the birds seen on the mountain were ducks, rail, the red bird of paradise, and others that could not be identified. A *Cuscus* was obtained, and many holes of rats and mice were seen. Insect life was abundant. The flowers included white and purple heather, wild strawberries, raspberries, and blackberries, buttercups, and a plant closely resembling the Swiss edelweiss. Many quartz reefs were visible, but no trace of gold could be discovered in them. The descent was made by the spur running south-east from the summit, and the party was back at Ioma on May 28.

During this expedition Mr. Monckton became convinced that there would be little difficulty in continuing the journey across the island to the south-west coast, by a route passing behind Mount Yule, well-defined tracks being seen to run in that direction. He has since, in 1907, carried out such an expedition, though apparently by a route

passing entirely to the north of Mount Albert Edward, by way of the Waria river. This stream, which enters Hercules bay a little north of the eighth parallel, had, until two years ago, been almost unknown, but was traced by Mr. Monckton to its source. The results of the expedition are embodied in our map, but no account of it is available, Mr. Monckton having left this country, while no reference to it appears in the Annual Report for 1906–1907, unless, possibly, in the statement that it had lately been ascertained that the tribes on the upper Waria were resident in British territory. It is also stated (p. 60) that three expeditions have lately been made to the tract occupied by the Red Creek natives—a very small tribe dwelling between the Gira and Waria rivers, and that in the latter part of 1906 a party of miners, with a white officer, had prospected the Waria for gold, but without success. As will be seen from the map, Mr. Monckton's latest journey has added considerably to our knowledge of the country along the Anglo-German boundary north of Mount Yule, as well as of the headwaters of the Lakekamu river.

Other recent work has been concerned with the country on the south-western side of the island, in the part of the Central Division north-west of Port Moresby. The routes of Dr. W. M. Strong (who, it will be remembered, took part, a few years ago, in the Daniels Ethnological Expedition to New Guinea) have supplied some useful information respecting the inland country north of Redscar bay and Hall sound, where the Roman Catholic missionaries had previously done some good work. The chief results of these journeys, with special reference to the native tribes of this region, are given below. On his journey towards Mount Yule Dr. Strong was accompanied by Father Fillodeau, of the Catholic Mission, who, according to the Annual Report for 1906–07 (p. 12 and map), has since made a more extended journey, accompanied by Father Chabot. The geographical results are embodied in our map. These travellers ascended the valley of the St. Joseph and its northern branch, the Arabure, to S. lat. 8° 10′, and their map shows the distribution of the native tribes of the region. Some photographic panoramas of the mountains to the north are also included in the report.

II. NOTES ON THE CENTRAL PART OF THE SOUTHERN COAST OF PAPUA (BRITISH NEW GUINEA).*

By W. M. STRONG, M.A., M.D., Magistrate for the Possession.

THE observations embodied in the accompanying map were made during a three years' residence in the area it represents. I first visited this portion of Papua as a member of the Daniels' Ethnographic Expedition, and on the return of the expedition an account of a portion of this area

* Map, p. 328.

was given in a joint paper by Dr. Seligmann and myself.* Since then I have spent over two years in the district as Resident Magistrate, and as far as time and other work allowed I have continued to make geographical observations.

The area mapped extends along the coast from the Purari delta on the west to Galley reach on the east, and is bounded inland by the Owen Stanley range, which forms the backbone of New Guinea. It is only at one or two points that the hills have been penetrated for any distance; while east of Cape Possession practically nothing is known of the inland country, although a number of the rivers have been partially traversed. For the most part the coast-line is flat; but in the Pokau district and at the Cupola the hills of the interior are continued to the coast. At Cape Possession and around Hall sound there is more high ground, but this consists of island-like masses rising from the surrounding plain. Yule island is one of these masses which is actually an island. Between Yule island and the mainland is Hall sound, the only harbour on the coast.

Numerous rivers empty themselves on the coast. The largest of these is the Purari, which flows into the sea by several mouths. The delta of this river is intersected by so many branch creeks that travelling is quite impossible except by canoe. The Lakekamu and Tauri rivers flow into the sea near Motumotu (Toaripi), and very close to each other. Here for some distance the coast-line consists of a series of shifting sandbanks and channels, which are difficult to traverse. Another large river, the St. Joseph, enters the sea at Hall sound, and the adjoining mainland is cut up by numerous creeks, which seem to be old mouths of this river. Other streams enter the sea at Vailala, at Kerema, and at Galley reach. Near the sea at both Kerema and Galley reach the rivers broaden out into extensive areas of water; but the entrances to both these and all the other rivers on the coast are shallow. During the south-east wind, which blows every afternoon for about eight months in the year, the sea is very rough, and it is difficult to land anywhere along the coast except in the neighbourhood of Hall sound.

Geologically, the area considered consists of the main range of the Owen Stanley mountains, formed of deep-seated or perhaps intensely metamorphosed rocks, of some smaller hills of stratified rocks, and of an alluvial plain formed by washings from the hills. On the flanks of the main range, volcanic rocks are often found, and a small isolated area of volcanic rock occurs at "the devil's castle" near the south end of Yule island. At the foot of the main range, large areas are formed by *débris* which has been washed down from the hills during floods. Away from the hills the low country consists of an alluvial plain deposited by the rivers. During the rainy season this plain is mostly flooded, and even in the dry season much of it is nothing but a swamp.

* See *Geographical Journal*, 1906, p. 225.

Good sections are seen on the coast at Pokama, Yule island, Cape Possession, and on the Cupola. Organic remains are found at the first three of these localities, while on the Cupola I have seen a narrow seam of carbonaceous matter. Geologically speaking, the area has been very recently elevated. At Cape Possession the strata are highly inclined, and at places vertical, yet the shells contained in them are identical with those now found on the seashore. In the interior the valleys are often deep, and the sides very steep, while the high ground between the valleys takes the form of narrow ridges.

East of Cape Possession there is little or no rain from about April to January, but during January, February, and March rain commonly occurs each afternoon. In the hills rain is more frequent, and is not uncommon throughout the year. The dry season corresponds with the south-east monsoon, and the wet with the north-west. West of Cape Possession the seasons are not so regular, and the rain is more equally divided between each month of the year.

At the mouths of the rivers there are large swampy areas covered with yellow mangrove. The red mangrove also occurs, and in places the rivers are lined with nipa palm. Near the coast there is some grass-land, but the greater part of the country is covered with very dense bush. Excepting the coastal grassland, there is no open country until the higher parts of the hills in the interior are reached. Around Mount Yule and at the source of the St. Joseph river there are considerable areas of open grass country, with a large native population. In the hilly Pokau district the bush is less dense, and it is here that sandal-wood has been found. Wild rubber grows in the forest, but is mostly of an inferior quality. Coconuts grow readily on the flat land, and some trading is done in copra, the dried kernel of the coconut. On the coast the natives cultivate the sweet potato, the banana, yams, and taro; and in the hills the sweet potato, yams, sugar-cane, and tobacco. Maize has been recently introduced, and is grown by some villages. In the swamps the sago tree is plentiful, and sago is an important article of diet and of trade among the natives.

It is quite impossible to give even an approximate estimate of the native population of the district. In the Purari delta there are several large villages containing populations estimated at two or three thousand each. Between Orokolo and Cape Possession the population is very largely confined to the actual coast-line. Here we get a narrow sand-bank formed by the sea, while a very little way inland there is only swampy land. The natives build their villages on the sandbank, and live largely on the sago, which grows everywhere in the swamps. East of Cape Possession there are several villages on and near the coast. These villages are for the most part small; but Waima has a population of about eleven hundred. From Inawauni to Inawabui-kipo the St. Joseph flows through a plain which contains numerous villages.

The Aroa river also runs through a similar plain, and on its bank are several villages. All these natives may be classed together as coast people, and are at home only in their canoes or on the plains; they are generally very unwilling to enter the hills. Natives of the Nara, Kuni, Kovio, Fuyuge, and Afoa districts live in hilly or mountainous country, and are generally unwilling to come down to the coast; but they make good carriers for the hills. Between the coast people and the hillmen living in the high mountains of the interior there is usually a belt of country with little or no population.

In the area covered by the map there are numerous groups of people often differing very considerably from each other. In order to illustrate this, the map has been divided according to the tribal groups which inhabit the country. While this division was primarily made for ethnographic and linguistic purposes, still it is very convenient for geographical purposes also. It is very noticeable that there is a distinct tendency for a tribal group to be restricted to an area showing definite physical characteristics, so that geographical and ethnographical divisions often coincide.

The Namau people live in the delta of the Purari river, and all speak the same language. They live largely on sago and coconuts, and at times they eat human flesh. They build large houses, but their canoes are very frail and without outrigger. Still, in these canoes they balance themselves easily, and can move quickly about the creeks of the delta. Their houses, pipes, etc., are plentifully decorated with designs derived from a human face.

The Elema people, so far as they are at all well known, live on the sandy shore of the Gulf of Papua. They also live largely on sago, which grows plentifully in the swampy country immediately behind the shore. They build large canoes with outriggers, and during the north-west season they go long distances in them along the coast. They appear to have borrowed much of their decorative art from the Namau people; but they do not seem to have ever been cannibals. Over this district several distinct dialects are spoken, but they are clearly only different forms of a common language. Very similar people are also found living up some of the creeks and rivers which flow into the Gulf of Papua; but the interior is practically unknown. It is interesting to notice that the only considerable area of high ground near the coast, viz. the promontory of the Cupola, is inhabited by a people apparently distinct and speaking a language with a very different vocabulary.

Yule island and the shore and creeks of the neighbouring mainland are occupied by the Roro people. These, in common with the Kabadi, Mekeo, Pokau, Kuni, Doura, and Motu tribal groups, appear to be immigrants. Linguistically, they are closely allied to the inhabitants of the Solomon and other Melanesian islands to the east of Papua.

Although the language of these groups has much in common, yet they each speak a distinct language. The Roro people cultivate their gardens, and do a certain amount of hunting. Their canoes are not so big as those of the Elema tribe, but during the north-west season they go out to sea in them, and trade with the Elema natives for sago. The Mekeo and Kabadi people subsist largely on the produce of their gardens, but they also hunt the wallaby and the wild pig. They use canoes but little, and then only for crossing the rivers and creeks in their own district. The Mekeo people occupy the flat country on the lower part of the St. Joseph river and the swampy country to the north. The Kabadi people live on a plain near the mouth of the Aroa river. Both these districts are very fertile, but are unhealthy. The Pokau or Nara tribe occupies hilly and comparatively barren country. Their gardens are not very productive, and in consequence much of their time is given up to hunting. They are a more energetic people than their neighbours on the coast. Closely allied to the Pokau people are the Kuni natives. These occupy the precipitous country behind Pokau and Mekeo. The population in the Kuni district is not dense, and only small villages perched on the tops of narrow ridges are found. Doura is represented by only a single village with a dozen or so houses, while there is only one Motu village in the area dealt with in these notes. The Motuans are great traders, and occupy many villages on the coast to the east of Galley reach.

The Fuyuge people occupy the upper waters of the St. Joseph river, where they have many large villages. Other villages exist between the source of the St. Joseph and Galley reach. Korona village belongs to this group, and is situated very close to Galley reach. Like the other mountain races of Papua, the Fuyuge people are darker and shorter than the coast people. Some of the Fuyuge villages are situated at an altitude of over 5000 feet, and here the temperature at night-time is sometimes very low.

The Afoa people are very little known; they live in mountainous country north of the upper part of the St. Joseph river.

The Kovio people live in the mountainous country near Mount Yule. Like the Fuyuge people, many of their villages are at a high elevation, and in one village I saw a hole scraped in the ground and apparently used for living in. The Kovio people are undoubted cannibals, and in part of the district much fighting used to be indulged in. They construct very peculiar houses. Each house consists of a long narrow building divided into separate rooms by cross-partitions. Each room has a separate entrance, and accommodates a family. In the Kovio villages on the upper Lakekamu river much tobacco is grown, and is smoked in a small bamboo pipe of a type quite different to any known elsewhere in British New Guinea.

A CANOE TRIP TO THE PLAINS OF THE CARIBOU.*

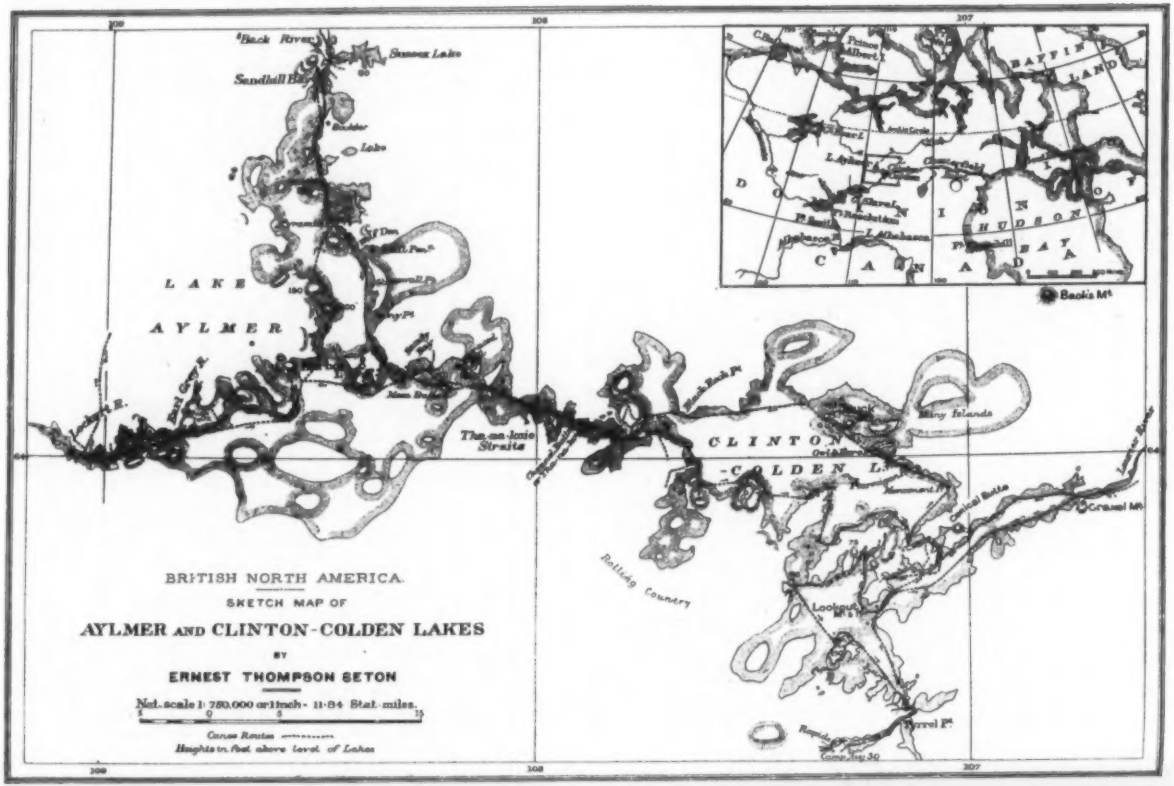
By ERNEST THOMPSON SETON.

In answer to the query many times put, Mr. Seton explained that it was throughout a private expedition organized, equipped, and directed solely by himself. Its objects were geographical and zoological exploration of the Barren Grounds or Arctic portion of the mainland north-west of Hudson bay. Although the region in question has been crossed by other travellers, as Hearne, Back, and Pike, it has not been explored, and large areas in it are quite unknown.

The expedition left the railway at Edmonton, on the Canadian Pacific Railway, in May, 1907, and at the Athabasca landing set out by canoe for a voyage of 1000 miles to the Arctic Barrens, the land of the cariboo, or American reindeer. For 500 miles the route was down the river that crossed the great Canadian wheat-belt, in which are lying idle grain lands enough probably to feed the empire. Partly overlapping the wheat-belt, but extending farther north, is the great Canadian forest which stretches 3500 miles from Atlantic to Pacific, with a width of some 500 miles. The timber in this is mainly spruce, and promises a supply of wood and pulp enough to serve the empire for generations, if not indefinitely. The northern edge of the forest is the beginning of the true Arctic Region, though here not within the Arctic circle. This was crossed on August 1, and from that time until September 15 the explorer's time was devoted to geographical and zoological research. Several weeks were given to compass surveys of the lakes Aylmer and Clinton-Colden. Two great rivers were here discovered: one running into Aylmer from the north was by permission named after the Governor-General of Canada, "Earl Grey river;" the other running into the east end of Clinton-Colden was by permission named in honour of the Premier, "Laurier river." The zoological results also were of some importance. No new animals, but much new light on known species was secured. It is particularly gratifying to know that the expedition demonstrated the existence of a considerable herd of American bison on the Slave river. After, they found musk-ox at Aylmer lake, and it was shown that caribou still exists in millions as in the most primitive times. On September 15 the return journey began, and on November 1 the expedition was safely landed without serious mishap at Athabasca landing. The journey, without hardship, was indeed a delightful summer trip, marred only by the annoying swarms of bloodthirsty mosquitoes that gave no peace day or night, and necessitated the wearing of nets and gloves.

In conclusion, Mr. Thompson Seton pointed out that he had taken the audience on a seven months' trip to the Arctic Region and back,

* Abstract of paper read at the Royal Geographical Society, March 27, 1908.



BRITISH NORTH AMERICA.

SKETCH MAP OF

AYLMER AND CLINTON-COLDEN LAKES

BY

ERNEST THOMPSON SETON

Net. scale 1: 780,000 or 1 inch = 11·84 Stat. miles.

5 0 5 15

Canoe Routes

Heights in Feet above level of Lakes

showing the country in some seventy-five representative slides, and that, while sunny landscapes, grassy meadows, and stretches of wild flowers abounded, there was not in any picture the slightest hint of frost, ice, or snow.

FORMATION OF VALLEYS IN POROUS STRATA.*

I. SOLUTION-SUBSIDENCE VALLEYS AND SWALLOW-HOLES WITHIN THE HYTHE BEDS AREA OF WEST MALLING AND MAIDSTONE.

By F. J. BENNETT.

THESE valleys, I consider, owe their origin far more to the action of underground water erosion lasting through a long period, coupled with long subsequent subaërial stream action, than to subaërial agencies only, which were quite a late factor comparatively, and which played a minor part. The Hythe Beds, an important water-bearing bed, consist of alternate layers of hard limestone and chert termed rag, and a soft calcareous stone or soft sandstone and impure sand, termed hassock. Sometimes the hassock occurs without the sag.

The points sought to be established are—

1. That these interrupted valleys were mainly initiated by swallow-holes, and that these were formed by upward hydrostatic action of water under pressure acting from below.

2. That the swallow-holes did occur, and still do, as may be seen in the Willington valley, in the bottoms of valleys, and also on or close to the watersheds; that connected with these are high-level spring ponds, and caverns as in the Willington valley.

3. That the upward hydrostatic action of water under pressure is introduced as a new contributory factor in valley formation, and that this in conjunction with subaërial stream erosion formed the swallow-holes when the valleys in question were under artesian conditions; that a frozen soil cap may act as a top impervious bed in the absence of such a strata.

4. That the channels of these subaërial streams were initiated by subsidence over the courses of the underground ones.

5. That the dry chalk valleys, especially where bourne-holes, either active or extinct, occur, and here classed with these swallow-holes, were formed in the same way as those in the Hythe Beds.

6. That varying water-levels also accompany these valleys, with instances of water passing underground from one valley into another one.

7. That if this mechanical plus solution theory be adopted, comprising early and long-continued subterranean water erosion, coupled with much later subaërial agencies and streams, instead of that of subaërial agencies only, then any denudation rates in such soluble strata must be greatly accelerated.

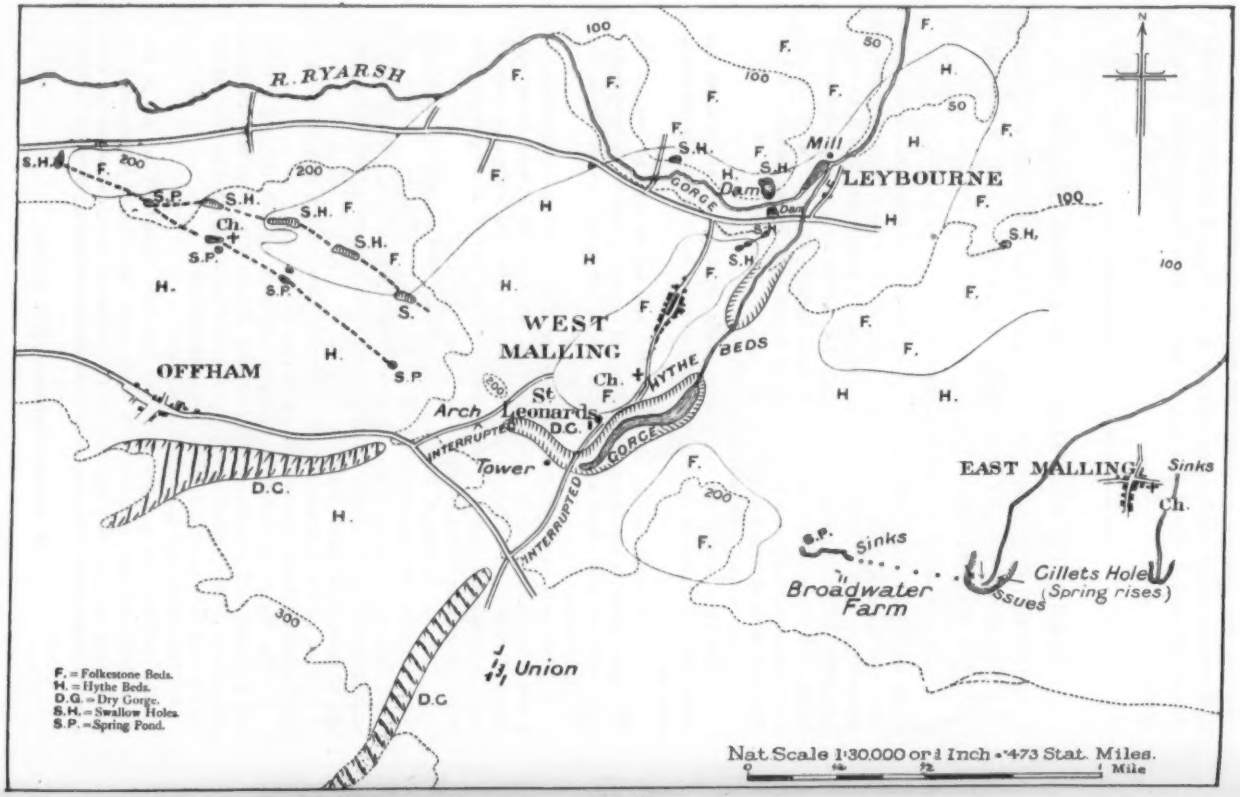
8. That outliers may help to form valleys.

The Swallow-holes and how they may have been formed.—These are in the Hythe Beds, and have, as far as I can learn, never been noticed before, owing no doubt to the fact that they are completely concealed by wood, and indeed are thus marked on the map. The largest of these, and the first seen by me, is Langley

* Research Department, May 15, 1908.

Interrupted Valleys, Swallow Holes initiating Valleys and Dam with Bourne Streams. Malling Area.

From recent Survey by F. J. Bennett, F.G.S.



S.P. = Spring Pond.

Nat. Scale 1·30,000 or 1 Inch = ·473 Stat. Miles.

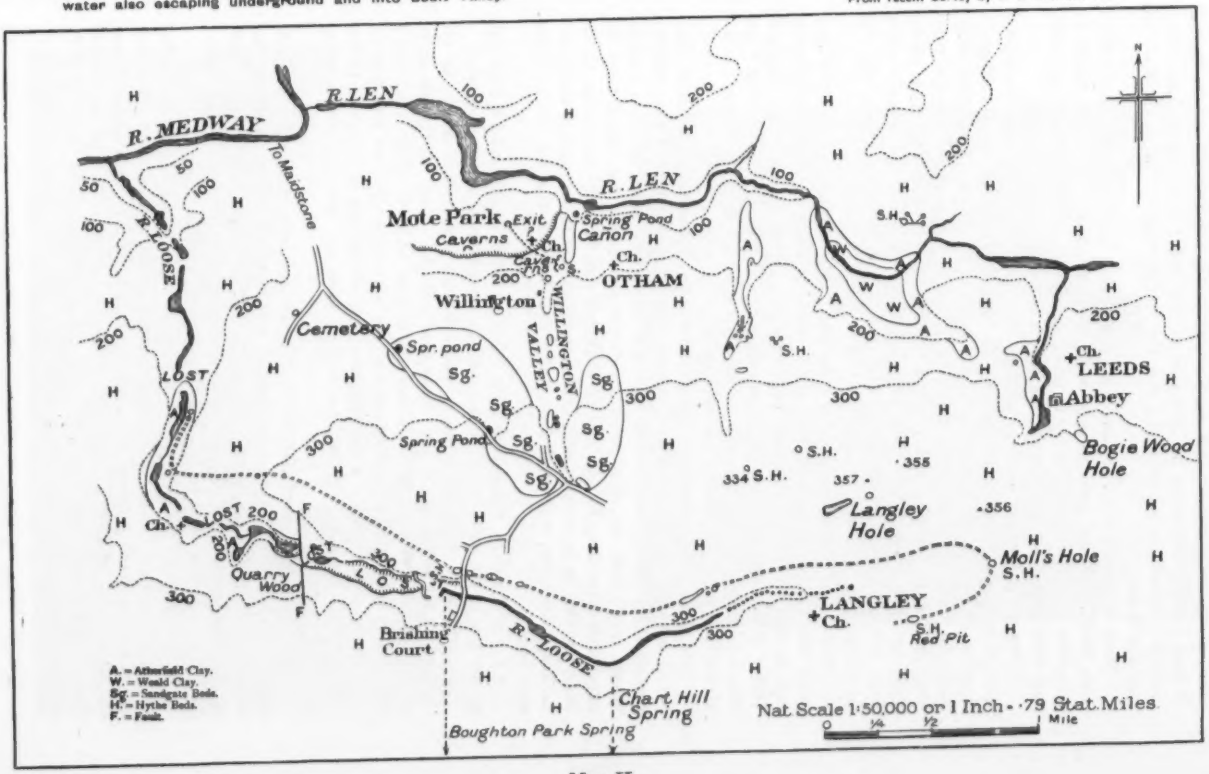
0 ¼ ½ 1 Mile

MAP I.

A new Swallow Hole Area in Hythe Beds with Valleys initiated by them.

In three stages: First, those four by Langley Hole on the water shed; second, those within Loose and Len Valleys thirty-four; third, those along the bottom, as in Willington Valley, with thirteen. The Loose and the Valley too is lost at Boughton Quarries, some water also escaping underground and into Beult Valley.

From recent Survey by F. J. Bennett, F.G.S.



MAP II.

hole, and as the name attracted me, I visited the spot so marked, and seeing only a wood I had to ask where the hole was, and was told "in that wood," and it was not till I parted the foliage that I saw the vertical sides of the hole, measuring perhaps 50 feet.

Many of these I found to have local names, such as Jacob's hole, Bogie Wood hole, Moll's hole, and some are said to be haunted. I have since that called the attention of the Ordnance Survey to them, and they will now be shown as holes, and with their local names, in the new edition of the map soon to appear.

They are of two forms, oblong and crater-shaped. A few occur on the highest ground, as on the water-parting between the Len and Loose, and some, thirteen in number, just within the Loose valley, and others, as those in the Willington valley, along the valley bottom. Langley hole, the largest of the oblong type, is 300 yards long by 70 at its widest part, and perhaps 50 feet deep. The bottoms of the oblong type are most irregular and pitted with deep holes, giving the idea of water action from below. The crater-shaped ones may be 70 to 100 yards in diameter, and may be 60 feet deep or deeper.

Some swallow-holes I consider to have been made when the area in which they occur was under artesian conditions. This would be when the Hythe Beds, underlaid as they are by the Atherfield clay, were also capped by the clayey Sandgate Beds. If we reconstructed a valley, as that of the St. Leonard's Park Gorge * (see Map I.), in such a formation, and replaced the denuded cover, the water in the Hythe Beds would be pent up and under pressure.

This water, acting mechanically and chemically during long periods of time, would have cut out underground channels, causing subsidences of the overlying deposit along this line of erosion. Into this subsidence, much later on, a visible stream would flow, and this would cut deeper and deeper into and through the impervious cover down to any lines of weakness, such as joints, etc., in the Hythe Beds, resulting, as in ordinary well-boring, in the release of the pent-up water, and its escape, doubtless, with much force. It is thus, I think, that the swallow-holes were formed.

Air also would be released with the water, and this would cause a freer and greater flow of the underground stream and the quicker erosion of its channel.

In process of time the series of swallow-holes thus formed would be obliterated by the action of the long subsequent subaërial stream, as this cut down to and coincided with the subterranean one, so that all trace of the preliminary process here indicated would be lost, and all the work appear to have been done by the subaërial stream alone. I consider, also, that the bournes in the chalk valleys were formed in the same way as these swallow-holes, and that they correspond to them.

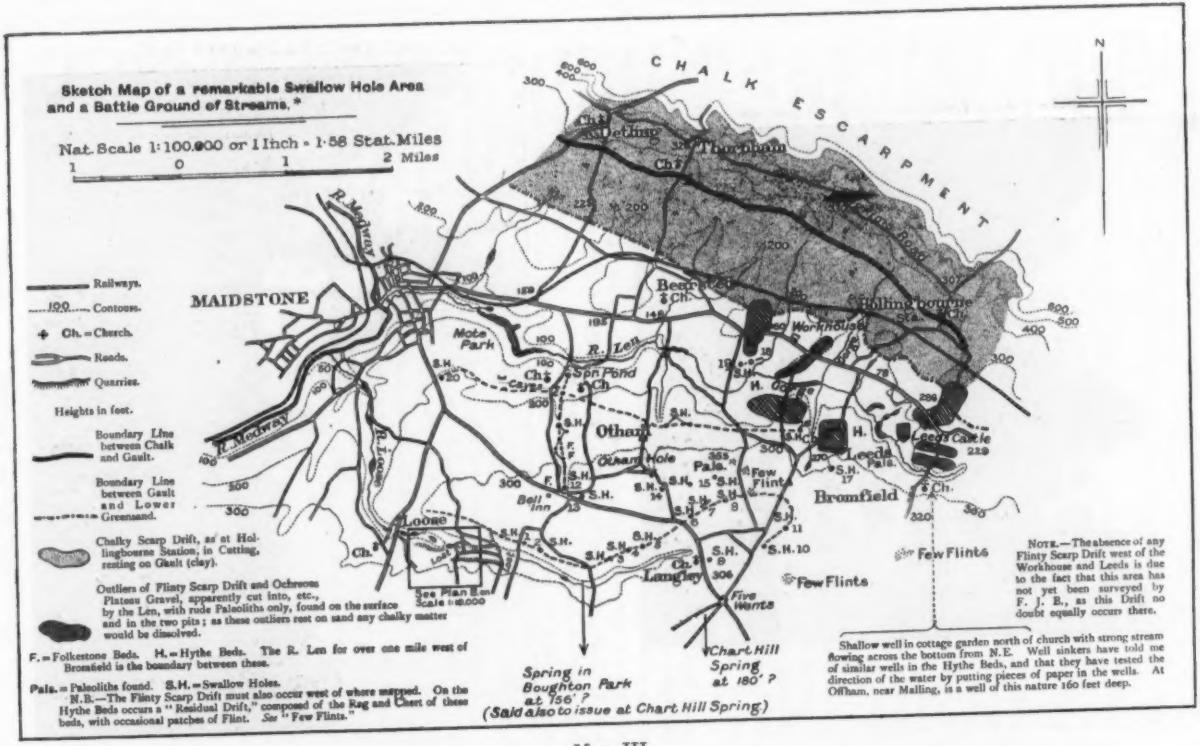
I have just paid a short visit to the Brighton and Lewes area, and have found some of these old bourne-holes in some of the dry-chalk valleys there, showing that they owe their origin to these once active bournes. The ponds, too, in these valleys, where they show no sign that they have been excavated, may well, I think, be old bourne-holes made water-tight, and thus utilized for ponds.

The Valleys and Swallow-holes of the Malling Area.—It was in 1899, on retiring from the Geological Survey, that I came to reside in Malling. I was much struck with the well-marked gorge in St. Leonard's Park (Map I.), where a stream rises, a tributary of the Medway. This gorge seemed to me too large to be the unaided work of this stream; the sides, too, were steep, and there was no valley drift, so that I thought some contributory cause must be sought for, and it occurred to

* See 'Ightham,' F. J. Bennett, Homeland Assoc., p. 129.

FIG. 1.—ST. LEONARD'S PARK GORGE.
(Photo. by E. W. Filkins.)

FIG. 2.—NATURAL DAM, LEYBOURNE.
(Photo. by E. W. Filkins.)


Sketch Map of a remarkable Swallow Hole Area and a Battle Ground of Streams.*
Nat. Scale 1:100,000 or 1 Inch = 1·58 Stat. Miles
1 0 1 2 Miles
CHALK ESCARPMENT
N
MAIDSTONE
R. Medway
R. Len
Boughton Park
Thurnham
Bell Inn
Loose
Langley
Five Wents
Chart Hill Spring at 180'?
Spring in Boughton Park at 156'?
(Said also to issue at Chart Hill Spring)
Railways.
Contours.
Ch. = Church.
Roads.
Quarries.
Heights in feet.
Boundary Line between Chalk and Gault.
Boundary Line between Gault and Lower Greensand.
Chalky Scarp Drift, as at Hollingbourne Station, in Cutting, resting on Gault (clay).
Outliers of Flinty Scarp Drift and Ochreous Plateau Gravel, apparently cut into, etc., by the Len, with rude Paleoliths only, found on the surface and in the two pits; as these outliers rest on sand any chalky matter would be dissolved.
F. = Folkestone Beds. H. = Hythe Beds. The R. Len for over one mile west of Bromfield is the boundary between these.
Pals. = Paleoliths found. S.H. = Swallow Holes.
N.B.—The Flinty Scarp Drift must also occur west of where mapped. On the Hythe Beds occurs a "Residual Drift," composed of the Rag and Chert of these beds, with occasional patches of Flint. See "Few Flints."
See Plan 2 Scale 1:2,000
Few Flints
Few Flints
Few Flints
Bromfield
Leeds
Leeds Castle
Workhouse
Note.—The absence of any Flinty Scarp Drift west of the Workhouse and Leeds is due to the fact that this area has not yet been surveyed by F. J. B., as this Drift no doubt equally occurs there.
Shallow well in cottage garden north of church with strong stream flowing across the bottom from N.E. Well sinkers have told me of similar wells in the Hythe Beds, and that they have tested the direction of the water by putting pieces of paper in the wells. At Offham, near Malling, is a well of this nature 160 feet deep.

MAP III.

* This map is reproduced from 'Ightham.'

FIG. 3.—STEEP RISE AT FOOT OF WHICH THE RIVER ISSUES. AT THIS RISE THE VALLEY IS INTERRUPTED.

(*Photo, by E. W. Filkins.*)

FIG. 4.—SWALLOW-HOLE, WILLINGTON VALLEY, THAT ALWAYS HAS WATER IN IT, AND WHICH RUNS OVER AT TIMES.

(*Photo, by R. C. Grant.*)

MAP III.

* This map is reproduced from 'Ightham.'

me that this must be that of the underground action of the water in the Hythe Beds when the area in question was under artesian conditions, and I then formulated the theory already stated.

An outlier of Folkestone Beds once occupied the site of this valley (see Map I.), which then would be under artesian conditions, and one or more swallow-holes may first have been formed, and then afterwards the gorge as now seen, the lake in which has some very deep holes in its bed.

Some twelve years ago striking confirmation of the great upward pressure of the water at the spring-head in the gorge was shown by the forcing up of a sewage tank placed there, and vast quantities of water had afterwards to be pumped away before this could be securely fixed.

At the termination of this gorge, in the park, the valley becomes gently graded for about a quarter of a mile, when another gorge comes on in Bankey meadows, ending with the junction of the St. Leonard's stream with the Ryarsh one at Leybourne Mill (see Map I.). In the Folkestone Beds, on the western side of the gorge, are three depressions (see Map I.). These I regard as swallow-holes, and they are along a north-and-south line.

West of Leybourne Mill the map shows a natural dam (Fig. 2), which once crossed the valley. The stream has cut part of this away. The dam is 10 feet high by 10 broad, and about 100 feet long, and has trees on it. North of and close to the dam is a large swallow-hole, and another to the west of it in the same wood. This dam I consider to be one of the dividing walls of other swallow-holes that initiated that valley. To understand this a visit must be paid to the Willington valley, with its thirteen swallow-holes (see Map II.), and where similar dams can be seen.

Returning to St. Leonard's gorge, this, after the stream-head is passed, continues as a dry one for a quarter of a mile. It then suddenly terminates, and is interrupted for about half a mile (see Map I.), and then continues till it terminates at Offham. Returning again to St. Leonard's, along St. Leonard's Street, a south branch of that valley is interrupted for half a mile, to open again for a mile and a quarter as a dry gorge west of Malling Union (Fig. 3).

Swallow-holes at Offham.—The map shows six swallow-holes all along one line, and parallel with the Ryarsh stream. This may be a joint line of weakness, and is close to the boundary between the Hythe and Folkestone Beds. The most westerly of these holes are round, and have water in them; the other four are dry and are oblong. A little south of these is a line of spring-ponds, parallel with the line of swallow-holes. These and the swallow-holes are on the high ground, and may have had their part in forming the valley below.

South-east of Malling, at Broadwater (see Map I.), is a spring-pond. The water from this sinks and runs underground for a third of a mile. With the loss of the stream occurs the loss of the valley. The water reappears at Well Street. With the reappearance of the water occurs that of the valley, with a well-marked cirque-like head. Here two other underground streams apparently come out at the spring-head, and the open stream then runs almost at right angles to that from Broadwater, goes through East Malling, and after that joins the Medway (see map).

The Maidstone area.—The area round Maidstone is of great physical and geologic interest; indeed, Sir Roderic Murchison said that no area in the south-east of England was better deserving of a monograph than this one. See *Q.J.G.S.*, vol. 7, 1851, pp. 349 *et seq.* Here I consider that ample confirmation is afforded of the initiation of the valleys there, and at Malling by swallow-holes; but I had formed this view before I had visited the Loose and Willington valleys, where the evidence seems so convincing.

FIG. 5.—WHERE FIRST LOSS OF LOOSE OCCURS: HERE THE WATER MAY BE SEEN PASSING AWAY IN TWO DIFFERENT DIRECTIONS.
(Photo. by E. W. Filkins.)

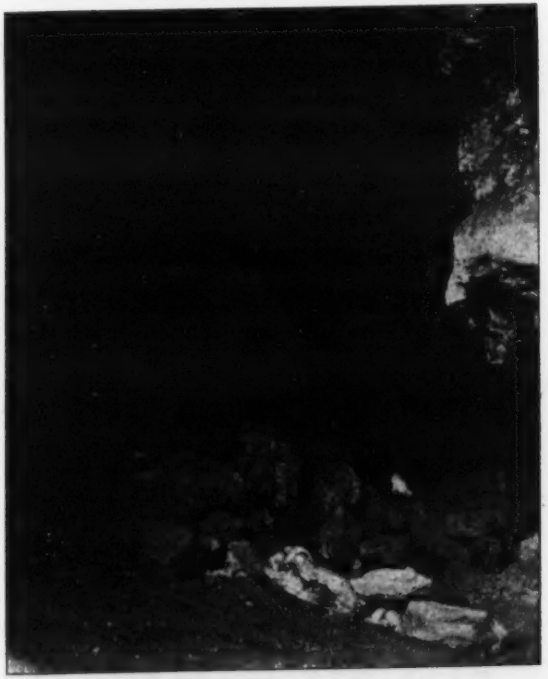
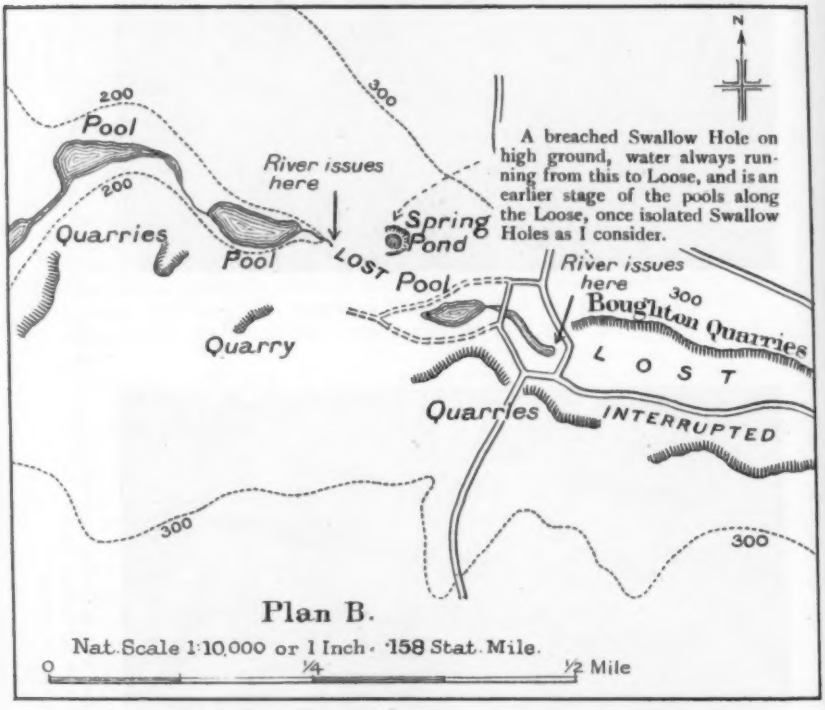


FIG. 6.—ONE OF THE CAVERNS NEAR END OF WILLINGTON VALLEY.
(Photo. by E. W. Filkins.)

*The Loose Valley.**—This is a most striking and most beautiful valley, and, were the sides bare rock, would compare with Dovedale, another limestone valley. One striking feature is, that, as perhaps its name may imply, the river is lost, and passes underground at least three times during its course of about 5 miles. At its lower part it is fed by powerful springs, and there paper-mills occur. In the upper part the flow of the water is very feeble, due, I think, as we shall see later on, to some of the water passing away underground into two other valleys.

One fact never noticed before is, that where the stream is lost the valley ceases



to exist and is interrupted and bridged over. Topley, in his 'Memoir of the Weald,' p. 112, considers that the loss of the river is due to a fault, but he only puts *one* fault, and yet there are *three* places at least where the river and valley are lost too.

I offer another explanation, and consider that the loss of the river and valley occur where hard rag occurs, and that the open valley coincides with the occurrence of the soft hassock. There are sections where the rag predominates, and others where the hassock almost entirely replaces the rag, therefore there would be hard and soft areas in the Hythe Beds and strong and weak places in any valley in them.

* See 'Ightham,' p. 131.

The quarries, too, occur naturally where the rag predominates, as the hassock has no value at all; and there, also, the valley is non-existent (see Map I. and Plan B). Another feature is the number of pools (see Map I. and Plan B) or small lakes on the Loose. Where these occur the valley is circque-like, and these pools, I consider, mark the sites of the swallow-holes that once initiated the valley. The sides of the valley are steep, and show very sudden and sharp dips (? slips); these also occur on the Hythe escarpment. There is no drift in it, all pointing, I consider, to subsidence and the predominating action of underground water, and under pressure when the valley was under artesian conditions.

I have stated that the Loose has suffered much loss of water in its upper part. Where the first loss of the river occurs north of Brishing Court (see Map II. and Fig. 5) there is good evidence that after heavy rains the excess water that cannot pass the small natural exit passes away underground to the south, and supplies the spring in Boughton Park, over a mile away and in the Beult valley. But also when the flow was normal, as on a visit recently paid in July, I and others saw some of the water passing away in an opposed direction to the Loose at the natural exit, and with no apparent cause for this; and I have been told that thirty-five years ago, some oil put in at the first loss reappeared at this spring in 2½ hours, and that fifty years ago another such oil-test, I am told, was made. The very powerful stream, too, with a fall of 200 feet in about a mile at Leeds Abbey (see Map II.), may also be robbing the head of the Loose, now dry most of the year for half a mile from its source.

There is good evidence that there are varying water-levels in the Loose valley, for some of the wells close to the stream are over 20 feet deep.

The Willington Valley.—This valley affords the strongest possible evidence of a valley initiated by swallow-holes, and indeed still in its swallow-hole stage, and one of arrested progress, due, I consider, to the fact, that owing to some cause the bulk of the water left it, perhaps rather suddenly, so that the separate holes did not get enlarged into a continuous valley.

I visited this one last of all, and it amply confirmed my previous ideas. In this short valley are thirteen swallow-holes, some very large (see Maps II. and III.), but only one is marked on the 6-inch map and this always has water in it (Fig. 6), and after heavy rains overflows and fills the two below it. Close by these is another called Smuggler's hole;* though larger and deeper, I have always seen it dry, as are the rest further down. It is noteworthy that where the swallow-holes terminate some six caverns occur (see Maps II. and III.); these are clearly due to water action, and they have been traversed for over half a mile. After the last swallow-hole is passed the valley terminates in a cañon; at the end of this is a spring-pond, always full. There may be a connection underground between this pond and the upper swallow-hole that always has water in it, and this water may pass underground into the pond which is close to the Len.

This valley is perhaps unique, and its character has no doubt been preserved owing to its having been thickly planted with trees; to this also may be due the fact that it has not been described before. I have found very few indeed who know of it at all.

The Len Valley.—As my space is limited, and as the evidence afforded by swallow-holes in the formation of this valley is not so striking as in the others, I must dismiss it in a few words only. But swallow-holes do occur, and once no doubt were more numerous, but, this valley being in a more advanced stage than

* I am indebted to Mr. R. P. Grant, of Maidstone, for the following approximate measurement of the hole: 462 feet by 132 feet, and 40 feet at the deepest part.

the others, most of them have disappeared. Some very well-marked gorges occur in this valley, which once, no doubt, were swallow-holes.

FIG. 7.—GORGE OF THE SHODE, IGHTHAM.

Concluding Remarks.—Thus the Willington, the Loose, and the Len valleys show various stages in the formation of a valley from the full swallow-hole stage as in the Willington valley, to the less apparent part at this stage in the Loose, and to the still less apparent in that of the Len; and yet if this key-valley, as I consider the Willington one to be, be first visited, then the stages in the others will, I think, become clear. In conclusion, I trust that I have done something to establish the points I made in the opening part of my paper, and have shown that in the area in question underground water must have played a much more important part in the formation of these valleys than subaërial agencies only.

II. THE CHILTERN VALLEYS.

By the Rev. E. C. SPICER, F.G.S.

A STRIKING morphological feature of the Chilterns is their strongly marked escarpment face. Seen from a distance the ridge crosses the horizon like a wall. The scarp face, however, is scalloped by a number of peculiar valleys. These valleys eat into the scarp wall and advance backwards nearly to the crest. The head of these valleys very frequently takes the form of a cirque, and from the cirque the valley descends gently to the plain with a floor that is level in cross-section. Other valleys descending suddenly from the crest have a steep but softly moulded outline and descend to the plain with a rounded cross-section. The spurs separating these valleys are bold and striking, with rounded edges. The chalk in every instance

comes quite up to the thin coating of soil, and there is no *débris* until the plain becomes well marked, and here it is due to other causes. The round-floored valleys are always dry, but when followed downwards there is always an issuing stream upon the plain. The flat-floored valleys always contain a stream at some time of the year which issues from the bowl at the foot of the cirque and spreads over the level floor, and is evidently the backward leakage, emerging from the saturated chalk above some hard band of chalky rock.

The streams issuing from the ends of the dry valleys tap the chalk at a much lower level, and are often permanent. But sometimes these deeply sunk valleys have three superposed water outlets. The lowest stream is permanent. The middle stream lasts longer than the upper stream, which runs only when the chalk is saturated and the underground water-level high.

The deeply pitted scarp wall is a very impressive physical feature, and many unsupported suggestions have been made to account for these deep and sudden embayments, ice gouging, glacial scour, fluvio-glacial torrents, and Pleistocene marine action being amongst the most common. None of these is supported by any local testimony. A cause is here suggested which is constantly in operation and is adequate to produce these results. The Thames carries down to the sea 800 tons of lime carbonate daily. This gives for the catchment area of the Thames 140 tons removed yearly from each square mile. A ton of chalk equals 15 cubic feet. Therefore, from each square mile of the chalk area, 2100 cubic feet of chalk are annually removed in solution, 210,000 cubic feet per century from each square mile (see Prestwich, *Q.J., Geol. Soc.*, 1872, vol. **28**, p. lxv.). There is nearly as much material removed by the Thames in solution (1 to 4000) as there is by the Mississippi in suspension (1 to 3000), and therefore "the level of the land is as much reduced by what is carried away in solution as if this were mud and sand removed by solution" (Prestwich, *loc. cit.*). The quiet, clear-graded, meandering streams are therefore powerful agents of degradation. This degradation is effected by underground solution, and this solution produces results that are stronger at certain points than at others. The whole surface of chalk is deeply pitted with swallow holes, some of which are 80 feet deep and 30 yards across. Swallow holes are a commonplace of every chalk region. In this case the solution results are evidently local. Some remarkable swallow holes, 30 to 40 feet wide, 20 to 30 feet deep, are cited by Prestwich (*Q. J. Geol. Soc.*, vol. **10**, p. 223), at Boughton near Canterbury. A number of streams run down over a capping of London Clay, and plunge into swallow holes in the chalk, and these holes never become full. These streams then make their way underground through any available subterranean channel where a crack or fissure exists, and at Shalmford Street a large and strong spring bursts out and runs into the Stour. Prestwich suggests that the swallow-hole water descends to the general water-level, but misses the fact that percolating acidulated water will make its way along a series of joints, and tend to produce a "master joint" which will carry an underground stream in hard limestone, but in chalk will tend to produce, by solution, a constantly widening and deepening area of weakness above which the superincumbent strata will sag, and produce at length a deeply sunk valley from the mouth of which, as in the Chiltern valleys, a stream will ultimately issue. If the water made its way downwards and merely joined the general water-level, it would issue in a broad and unbroken sheet of soakage at spring-level, but inasmuch as it does not, but issues in strong local springs and streams, it is clearly collected into underground channels where solution activity is localized and concentrated. Topographical results must follow from the removal of 210,000 cubic feet of chalk per square mile per century. It is suggested that these results are seen in the Chiltern valleys, which are therefore regarded as "Solution Valleys."

A strong contrast is noticeable between the scarp face of the Chilterns and that of the Berkshire downs, just across the Thames. Here the heights are not so great, and the slope to the plain is gentle. There is no wall. In the Chilterns a drop of 500 feet in a mile is not uncommon. In the Berkshire downs a slope of 400 feet in 7 miles is more usual. Below the Chilterns there are no gorges, but only broad open valleys. The Berkshire slopes are deeply trenched. The formation of the rock is in each case similar, but the trend of the joints in relation to the scarp slope is different. In the Chilterns the ridge is parallel to the joints, and has a strike trend, while the dip joints, at right angles to the strike joints, run straight into the scarp wall, and form readily a series of fissures that constantly widen and are kept clear by the ultimately issuing streams. The general height of the plateau will not be readily lowered, but the solution valleys will be very strongly marked and their contour-lines will be closely crowded, while the readily escaping water will form no gorge channels. On the other hand, when, as in the Berkshire downs, the scarp slope runs *across* the joints at an angle, the escaping soakage will tend to choke the joints as it passes over and through them, will make the chalk block more nearly impervious, will thus lower the general plateau-level, while the issuing streams will carve gorges along the more gentle slopes, as they do in the Berkshire downs. So soon, however, as the downs turn, as they do at White Horse hill, and resume the strike trend, the Chiltern features are again immediately manifest. The same cirques, the same crowded contours in the valleys, the same bold spurs, and the same sudden descent from greater heights through short broad open valleys to the plain, while the gorges entirely disappear.

The dip-slope valleys, originating upon the dissected plateau and descending towards the London basin, have characters reminiscent of the dip-slope valleys of the Cotteswold Limestone plateau. Here, too, the valleys at length end in issuing streams. The swallow holes are filled with superincumbent *débris*, and the overlying Tertiary clays subside into the weakened and yielding chalk. In some cases, as at Henley, the valleys run far back towards the escapement crest, which they nearly touch. In other cases, as in the Risborough and Tring gaps, they have eaten right through and joined the scarp valleys, and here the Chilterns have entirely disappeared, allowing the railway lines to pass through the gaps. In one very remarkable case the Thames has taken advantage of such a solution gap, and meanders through the gorge at Goring, before sweeping round to the Henley depression. A precisely similar and parallel gap runs near the Goring gap, from Didcot to Newbury, and carries the waters of the Pang past Hampstead Norris. It will be seen that the Thames, in the curves below Oxford, points towards three valleys in turn: towards Newbury, Reading, and Henley. The stream chose the Reading route through the chalk, and has, consequently, modified that valley, but there is no structural difference between these three valleys, and there is no reason why they should be considered as being due to different causes. The characters of the Goring gap are equally strongly marked elsewhere, and that line of solution weakness is here considered to have got just so far ahead of the others in the "solution valley" formation at some period, as to have determined the issue of the meandering and uncertain river that at length flowed directly through it.

The strongly marked Chiltern valleys run in various directions, but they are in the main "joint valleys." There are no heights sufficient to produce them by superficial denudation, there are no alluvial fans showing the results of underground action, there is no evidence of fluvio-glacial scour, though some ice-action is evident in places, and there is no evidence of strong marine currents. They are too varied in trend and too marked in character to be due to any possible cause that can be logically suggested except one, but they display universally the characters

and results that would naturally arise from the percolation of acidulated water through rock so easily soluble that along broadening joint and fissure lines 2,100,000 cubic feet of rock at least are removed from every square mile in every 1000 years, leaving deep valleys of marked depression sunk throughout every chalk region in every part of England where that rock is found.

After the paper, Dr. STRAHAN: I think that we are under a great debt to Mr. Bennett for calling attention to these swallow-holes, which I believe were altogether unknown until he discovered them, at some risk to himself as I understand. They remind me of swallow-holes which occur on plateaus of Carboniferous Limestone. Though the holes are rather bigger on such plateaus, yet they are dotted about in the same sort of way. It is always difficult in such cases to see where the water goes, whether it issues into some river to the south, or into quite another to the north. In one moorland that I have in my mind reservoirs were made, and it was desired to collect in these reservoirs all the rain that fell on the moorland. Numerous channels were dug to conduct the water past the swallow-holes, and to bring it into the reservoir. But I do not know a single case in which the water which entered the holes was satisfactorily traced. In many other regions, however, it has been traced. In one interesting example a stream disappeared into a swallow-hole which was obviously not large enough to take all the water in time of flood. On my next visit I found that part of the stream was going down the swallow-hole, and part of it following the old course. The one part went into the Irish sea by a fairly direct valley, the other part by an entirely different and far longer route. That was a case where the water which had got into underground channels was diverted entirely from the line of valley. More commonly, the existing ravine, often dry, is followed more or less closely by the underground channel. In fact, it is not uncommon to find holes in the river-bed down which you may creep, and along which you may hear the underground river passing. Herein may lie the explanation of an interruption that Mr. Bennett speaks of in one of the valleys; possibly the river found an underground channel before it had had time to make a valley of any notable depth.

With regard to the second paper, I cannot help thinking that Mr. Spicer wrongs geologists in supposing that they attribute the underground channels to erosion; such channels have always been regarded as having been due to solution. I can hardly conceive how they would start in any other way, and they bear in their shape the evidence of such an origin. A little erosion, no doubt, goes on, but solution is the principal cause. Dry chalk valleys are familiar all over the country where the chalk occurs. Generally, you see nothing except what Mr. Spicer describes, namely, a flat bottom which is occupied by some sort of *débris*, and is bounded by slopes of bare chalk, but there are many places on the coast where more is visible. In Dorset, where dry valleys are dissected by the cliffs, it may be seen that the underlying chalk is rotten, and undergoing solution. The bottom of such a valley is actually being lowered as Mr. Spicer claims. I was interested in one of the photographs, which seemed to me to illustrate a point he made—that the bottom of such a valley with its *débris* is actually now sinking, and that there is a line dividing the subsiding material from the slopes of solid chalk which are not moving. I have myself noticed marks or lines at the feet of such slopes, but the possibility of their having this origin never occurred to me. It is a point which would be worth investigating, and if it proves to be true, I see no reason why the movement should not be measured. Some such apparatus as that devised by a British Association Committee for ascertaining whether there is any movement in

progress along lines of fault, might be used for the purpose. If movement is in progress it would probably be detected in a year or two. There is a great deal of suggestive material in both these papers.

Mr. G. W. YOUNG: I have listened with very great pleasure to the paper by Mr. Spicer, and I regret that I was not here in time to hear Mr. Bennett. My own observations with regard to these dry chalk valleys have been principally confined to the county of Surrey, where the valleys are not quite of the same character as a good many of those Mr. Spicer spoke about, because I understand the principal class that he referred to were what one might call obsequent valleys, while in Surrey we have not many valleys of that sort, and those that there are, do not seem to be anything like so long as those shown in the photographs. But with regard to the valleys which run in the opposite direction, I think that there is a very considerable amount of evidence that they have been made by solution, and practically solution alone. If we take the alternative to solution, *i.e.* erosion of the chalk by means of torrents due to the melting of the ice at the close of the glacial period, it seems to me that you have not got anything like sufficient gathering ground for the snowfields (or glaciers), which would provide the torrents by their melting, in order to account for the valleys going in both directions. I believe Mr. Clement Reid originally suggested the melting of the snows to account for the presence of the combe rock in the valleys in the South Downs, where you have a large amount of material apparently deposited in a tumultuous manner, and that theory—that the whole of the valleys have been excavated while the ice had frozen the chalk into so hard a mass that it was able to be acted upon by erosion in some way as if it were a hard rock—seems to have been applied to valleys which he had not in his mind when he originated the theory for the combe rock. Well, if we consider these deep valleys as being the product of a state of affairs which one may regard as temporary, it seems to me that sufficient time has elapsed since the passing away of those glacial conditions for the removal of such prominent characters of the landscape; because we must suppose that when all the snows were melted, the action of the deepening of these valleys ceased, and that therefore ordinary atmospheric denudation would subsequently tend to lower the general level of the country, and so obliterate such prominent features. Whereas if we imagine that they are due to solution, and there is no reason whatever to doubt that solution may be going on as actively at present as it has ever done, they are probably being deepened rather than being obliterated, and that can be partially proved by studying the material that you find in the bottom of these chalk valleys. If you go down to the Polesden valley, near Box hill, you will find that the material on the floor of that valley is composed of a large number of flints, most of them showing no signs of being rolled about, and moreover, occasionally you may pick up in these flints fossils which are not abraded in any way. The flints are embedded in loose "pelletty" chalk, which is in small rounded fragments, apparently due to slow dissolution. I do not know the Cotswold area, but with regard to the Chalk a very strong case can be made out for their formation by solution, and I may say that Mr. Jukes-Browne, in his memoir on the Cretaceous rocks of Britain, gives solution as being one of the causes which have produced them, and he goes on to point out the protection afforded by the clay coverings which you get, at all events, in Surrey, on the top of the plateau. It is, to my mind, this concentration of the rainfall into certain definite areas which would more rapidly produce dry valleys, than if the clay-with-flints was not present, and therefore I should imagine that in the Chiltern district, if there is no clay-with-flints, or other clay material on the plateau which would act as a protection to certain portions of the ground, the production of these dry valleys would be much slower in that area than in Surrey, where you have the rainfall concentrated into

very definite areas. I have listened with very great pleasure to the lecture, and I thank the authorities for inviting me to be present.

Mr. Bennett, in reply, said that his view that such valleys as he had described had been initiated by swallow-holes had by some of his friends been severely criticized, but one of these, at least, had been much impressed apparently since Prof. Gosselet, of Lille, had in a recent paper stated that the "creuses" [swallow-holes] of the chalk area of Artois and Picardy could, he thought, be explained only by subsidence from underground water-erosion, and in the same paper he stated that this action of water in limestone areas had not had due importance assigned to it. Mr. Bennett also said that he thought that the evidence for the formation of swallow-holes from below was very clear in the areas he had described. That water could pass underground from one valley to another, as he had shown was almost proved in the case of that from the Loose valley passing underground to that in the Beult, was nothing very new, as such cases had been proved in Yorkshire.

In the 22nd report of the East Kent Natural History Society, Captain McDakin, Dover, on "Nailbournes at Bridge and Petham," etc., gives his opinion that "blow-holes" may be formed by a cylindrical column of water acting on the limestone above it like a fountain jet.

Mr. Spicer: I have only to repeat my thanks to the Society for the privilege of reading my paper. I welcome Dr. Strahan's suggestion for measuring subsidence, but there is a certain difficulty owing to the fact that the chalk in these subsiding valleys is often rotten. The solution valleys investigated by Mr. Young are, I think, of the same character as those leading from the Chilterns to the London Basin, where the overlying clay has subsided into the chalk hollows.

Major Close: I think we are very fortunate to have been able to listen to such excellent papers as those we have just heard. We are apt to lose sight of the fact that it is practically impossible to be a good geographer unless one knows something of geology, and we are very much indebted to Mr. Bennett and Mr. Spicer for having given us this opportunity of listening to such excellent accounts of a very interesting subject, and I am sure you would wish me to thank them for their papers.

REVIEWS.

EUROPE.

Istria.

'Die Halbinsel Istrien.' Landeskundliche Studie von Dr. Norbert Krebs, K.K. Realschulprofessor in Wien. (Penck's *Geographische Abhandlungen*, Band IX. Heft 2.) Leipzig: Druck & Verlag von B. G. Teubner. 1907. Pp. 166. *Price* 6*m*.

We have here a detailed account of the peninsula, its geology, hydrography, climate, and vegetation, its inhabitants and their industries. The peninsula has the form of a triangle about 60 miles long, with a maximum breadth of 46 miles, and rises from the south-west coast gradually up to the Dinaric Alps. Owing to its undulating surface and the absence of coastal plains, it may be regarded as a part of this range jutting out into the sea. On the whole, Istria may be called a karst land, for three-fourths of its surface consist of karst-forming limestone, and only one-fourth of sandstone and marl. It falls into four zones—a zone of flysch in the valleys of the Wippach and Reka, another between Triest and Salvore gradually contracting south-eastwards to the Čepić lake, and between these two

broad zones of limestone. These latter zones have much in common, the karst phenomenon being present in both, but the high karst land of the interior is of a mountainous character, particularly the Tschitschenboden, with an average elevation of over 2600 feet, whereas the Istrian plateau is for the most part a surface of abrasion sloping down to the Adriatic from a height of 1500 feet, with a steeper fall towards the Arsa channel and the Quarnero. Here, on a deep layer of soil produced by weathering, fruit, vines, and corn flourish. The sandstone zones form hills or uplands of gentle outline. The difference between the two zones is due to elevation, the more northern zone being higher, and to the difference of climate. With few exceptions, the streams of the peninsula are confined to the sandstone districts. As regards climate, the peninsula is a transition region between the mild Mediterranean climate and the central European climate. The summer is very dry, and heavy rain falls in autumn. Climatological factors have made a great impression on the physical geography of the country and on the vegetation. The higher parts at a distance from the sea have the dense vegetation of the Central European climate, with dark woods of tall trees and green meadows, while in the lower parts nearer the sea the vegetation becomes more scattered, meadows are absent, bushes take the place of woods, and the plants become hard and thorny, and their leaves are covered with hairs, which retard evaporation. Dr. Krebs also sketches the history of settlement in Istria, and describes the present population of Germans, Slavs, Serbo-Croatians, and Italians, and their occupations. Almost all the land (97½ per cent.) is productive, according to statistical reports, and 67 per cent. of the population live by agriculture and the exploitation of the forests. Other branches of industry are also touched on, and the distribution and increase of the population is described. Numerous sketch-maps and sections illustrate the work.

Russia.

'Länderkunde von Europa, herausgegeben unter fachmännischer Mitwirkung von Alfred Kirchhoff. Dritter Teil: Russland. Von Prof. Dr. Andreas v. Krassnow in Verbindung mit Prof. Dr. Alexander Woeikow.' Leipzig: G. Freytag. 1907. Pp. 336. *Price* 3 m. 50 *pf.*

The difficulty of finding an author thoroughly acquainted with Russia in Europe, and other obstacles, have long delayed the appearance of this volume. The work has been at length brought to a successful conclusion by Prof. Krassnow of Kharkof. Nearly half of the book is taken up with a description of the geology, coasts, configuration, and hydrography of the country, which is in general carefully drawn up. The author's account of the Ural-Baltic ridge seems to be new. On p. 2 he says, "North of the Central Russian plateau a number of elevations may be noticed. They come out of Finland as the Maanselke-Olonets ridge. Extending further east, north of the Onega, they merge imperceptibly into the Severnyie Uvaly, where more exact measurements are desirable," and on p. 104 he says of the Uvaly that, "although regarded as an offshoot of the Ural system, this hypothesis is not yet proved. They run east-south-east along the southern boundary of the province Vologda and disappear at the Kolo lake." Several geographers have denied the existence of a continuous ridge between the Urals and Baltic, while many trace it from Kurland, but the connection of the Uvaly with the Urals has been taken for granted. The chapter on climate is by Dr. Woeikof, the greatest authority on the subject. The influence of snow has been the object of exceptionally thorough observation, and Dr. Woeikof makes the striking statement that without the snow-covering the cultivation of winter corn would be impossible over two-thirds of the area of European Russia. Other

chapters deal with the fauna and flora, the races and the numerous mixed peoples, means of communication, administration, economical development, etc. A few words might have been given to education, and the Duma should have been mentioned. The general condition of the people is, however, fully described in connection with agriculture and industries, and the causes (land tenure, etc.) which arrest the progress of the Russian people are noted. The last chapter, on the towns, is of the nature of a gazetteer. If a smaller number of principal centres of industry and commerce had been selected, and their origin traced to the natural or political advantages of their situation, this chapter would have been better suited to a geographical work. The illustrations include many small maps, but some one would expect to find are absent. Such are a hypsometrical and hydrographical map on a larger scale than can be inserted in the text, a geological map, and a map showing the minerals and chief manufacturing centres; also a railway map. On the whole the work is a valuable contribution to geographical literature, especially the chapters on physical geography, which are compiled from the latest information. Exact surveys have not been executed over a great part of Russia, and many geographical problems still await solution.

ASIA.

Across Asia.

'From Pekin to Sikkim: through the Ordos, the Gobi Desert, and Tibet.' By Count de Lesdain. *With Map and Illustrations.* London: John Murray. 1908.

There being nothing to show that this book is a translation from a French original, we shall assume that the author has written it in English as it stands; if that be so, the performance is at once highly creditable to his knowledge of our language, and explains some slight peculiarities of expression to be found here and there throughout the volume. Moreover, he was unexpectedly summoned to South America before the sheets had finally passed through the press, and Mr. Murray, at his request, has written the preface. From it we learn that the journey was in fact a wedding trip, "undertaken to gratify our wish to cross country hitherto unknown, and if possible to increase the geographical knowledge of our day." The ambition is laudable, and is in a measure fulfilled; for though other travellers have crossed and recrossed the route selected by the Comte and Comtesse, none can be said to have followed the precise line save here and there on known roads. The names of Major Bruce, Sven Hedin, Rockhill, Littledale, and Bower in recent times, and of Huc and Gabet in 1845, occur to any student moderately familiar with the geography of Chinese Turkistan and Tibet, and many other names might be added.

Our travellers started from Pekin on June 20, 1904, reached Sïen-hua-fu on June 26 *en route* for Mongolia. At Or-tan-ho, where they expected to find Mongols, they found Boxers, the place being a retreat for brigands and a nursery for rebels. Passing on to Ta-tung-fu, they visited the grottoes of Yung-yang-miao containing relics of Buddhist architecture. "Though now in poor preservation, they remain a proof of some sculptural achievement. Each room contains over a thousand figures, some nearly 6 feet high, others only a few inches. The ceilings especially are a maze of painted dragons. The statues also were painted, but are now discoloured by the effects of the water." Further on a diversion was made to Edchen Koro to see the tomb of Chinghiz or Jenghis Khan, "so jealously guarded," says the preface, "by its custodians that no European has hitherto been able to discover its actual site, much less to see it." Yet in Yule's 'Marco Polo,' 3rd edit., vol. 1, p. 249, mention is made of visits by MM. de Vos and Verlinden, two

Belgian missionaries; and M. Cordier (relying apparently on Rockhill, 'Diary,' p. 29) says, "The last traveller who visited the tomb of Chinghiz is M. C. E. Bonin, in July, 1896." The description given in this note agrees reasonably with that by our author: "Two small tents, one behind the other, and connected by a very low inner door, made of worn-out felt, and admitting through their rents the rain and the wind, are the 'monument' destined to perpetuate the renown of the greatest conqueror the world has known. . . . The ashes of the body of Jenghis Khan are deposited in a kind of chest, cubic in shape, and placed on a wooden support made of small coloured pillars, adorned with paintings on all its sides, except that facing south, which is covered with a finely worked copper plate representing a divinity surrounded by four animals which are difficult to identify. . . . The Tomb, in fact, has not always been here; but it is difficult to know exactly where the first descendants of the great Emperor laid his remains."

Thence the travellers crossed the country of the Ordos to Ning-hsia, on the Yellow river, a town described as killed by opium, and passing round the Alashan mountains *viâ* Lan-chou reached An-si-chou, whence they proceeded in a fairly direct line, considering the country, across Tibet to Shigatse on the Brahmaputra, where they were entertained by Captain O'Connor. They then passed into Sikkim and enjoyed the hospitality of Mr. Claude White, the political agent, "with the pleasant feeling of having succeeded at all points in our long and dangerous journey."

The volume is well turned out, and there are not many printer's errors. At p. 54 "heaps of verdure" probably have been substituted for something less fragrant; and at p. 139 a well-known name appears as Baron von Reichtoffen! The illustrations are fair, and the route map, though sketchy, is sufficient. The author's transliteration of names has generally been followed in this notice.

W. Broadfoot.

AFRICA.

West African Borderlands.

'Les Frontières de la côte d'Ivoire de la côte d'Or et du Soudan.' Par M. Delafosse. Paris: Masson et Cie. 1908. *Price* 6 *fr.*

M. Maurice Delafosse is known as a sympathetic and patient investigator of the manners and customs of the negroes of the Upper Guinea coast. He is also an expert surveyor, and the book before us records the work of the Anglo-French commission, which, in 1901–1903, determined the boundaries indicated in the title of the volume. M. Delafosse disclaims for himself and his colleagues the title of explorers, but the accurate mapping of 3750 miles of frontier was no mean achievement. The book is, however, of greater value for its ethnographical than for its geographical information. The author has studied several of the languages spoken by the Ivory Coast natives, and is thus the better able to enter into the ideas of these primitive folk. He has interesting philological notes, showing that amid much linguistic confusion similarity of structure exists among diverse Negro languages. No one tongue is common over a really wide area, though Fanti is more or less the official native language on the Ivory Coast. A considerable part of the value of the book lies in its panoramic effect. From the forest regions of the coast we pass to the open plains of the plateau, and to the upper basin of the Black Volta, and note successively the difference in the character and culture of the inhabitants—the N'Denie, Abrow, Birifo (about whom there is much new information), Dagari, etc. In the northern region the boundary commission found still in ruins several small towns and villages ravaged by Samory many years since

(M. Delafosse, by the way, entertains a high opinion of that redoubtable opponent of the French); in the south the good effect of European administration was evident in prosperous villages and well-cultivated lands. A chapter is devoted to the history of "the Jenné of the South," Bondoko (Bonduku), the fullest we remember to have seen, and a distinct addition to the scanty records of the Guinea negroes. It is stated that the (now hidden) Ashanti gold stool was captured by the Ashantis at Bondoko about 1820, and taken in triumph to Kumasi. M. Delafosse's volume is well illustrated, and has a small sketch-map; but, like too many French books, it lacks an index. It is a substantial work, containing matter of permanent value.

F. R. C.

AMERICA.

The Vegetation of Chile.

'Die Vegetation der Erde. . . .' Herausg. von A. Engler und O. Drude. VIII. Grundzüge der Pflanzenverbreitung in Chile, von Dr. Karl Reiche. Leipzig: W. Engelmann. 1907. Pp. xiv. and 374. *Maps and Illustrations. Price* 20 *marks.*

For this, the eighth volume of Engler and Drude's valuable monographs on the vegetation of the world, we have to thank Dr. Karl Reiche, who is, of course, the foremost authority on Chilian plants.

The general scheme follows closely that of other volumes of the same series. There are sections dealing with the orography, hydrography, and climatology, vegetation forms and vegetation formations, biology, an historical introduction, including a long and valuable list of books and papers dealing with Chilian plants or with natural history, and also detailed descriptive lists of the vegetation of twenty-seven selected portions of the mainland and three groups of islands.

The disappointingly short and condensed account (some twenty-five pages) of the development and origins of the Chilian flora is, however, of real interest to all geographers, and it is especially valuable as giving, so far as one can judge, the latest opinions of Dr. Reiche himself upon such vexed questions as the age of the Andes and a former connection of South America with the Antarctic continent. So far as the distribution of South American plants is concerned, he is probably the best living authority, and one would be inclined to take his views on the subject as conclusive, were he not so extremely cautious and so guarded in the expression of them. Indeed, Prof. Dr. Reiche has taken so much care to give all the evidence that could be advanced against his own conclusions, that it is sometimes very difficult to discover whether he believes in them or not.

An interesting and characteristic example occurs in his treatment of a new discovery made by himself. He found that on the dry and arid cordillera, which is patiently grazed by hungry mules and guanacoes, several plants are exceedingly difficult to see. Their leaves are exactly the colour of the reddish-brown soil on which they grow. No sooner has one realized the interesting character of this new discovery in protective coloration, than Dr. Reiche promptly destroys all the importance of his own observation by the remark that the theory (of protective colouring) "is scarcely tenable, for most of the named examples would give but a right small bite."

He distinguishes seven contingents in the Chilian flora. Two of these (Cosmopolites and Introductions) are not of any general interest. As regards another, the North Temperate (and often European) contingent, it is very interesting to find *Armeria*, *Alopecurus alpinus* and *Phleum alpinum*, *Saxifraga cæspitosa*, and many others flourishing in Chile, but there is no satisfying explanation for their presence there. The albatross may, as has been suggested by Pax, have introduced *Gentiana prostrata* to the cordillera.

But the existence of a well-marked Antarctic contingent has long been understood, and Dr. Reiche gives a full account of it. There are one hundred and four genera and sixty-five species common to Chile and to New Zealand. Moreover, seventeen of the genera are markedly Antarctic.

Even if one excludes such genera as Salsola, Urtica, Poa, and all ferns with species like *Montia fontana* and *Potentilla anserina*, there are more than enough remaining to imply a former land connection (or island chain) with an Antarctic continent which also reached out in promontories or islands towards New Zealand.

It is surely impossible to explain such close and far-reaching affinities as these by Humboldt's current or the agency of birds. The presence of Antarctic beech itself would not be easy to explain, for though its seeds are "winged," their power of flight is surely a very rudimentary one. Moreover, the Antarctic contingent as a whole behaves exactly as one would expect. It is rich in numbers near Fuegia, where the climate is essentially an Antarctic one, and gradually tails out as one proceeds northward to the dry and hot districts of middle Chile. *Primula farinosa* extends to 39° S. lat., and a whole colony of southern forms exists in the classical wood of Fray Jorge in 30° 40′ S. lat.

But the tropical American contingent is more interesting still. The coast mountains of Chile, composed of crystalline schists, granite, and eruptive rock, are by far the oldest part of the country. They existed when there was no Andes, and when South America consisted simply of Archiplata, Archiguyana, and Archibrazil—that is, of three isolated land masses separated from one another by great sea-inlets. During the Mesozoic period these land masses were inhabited by a common flora; at first—that is, in the Rhætian period represented by the lacustrine deposits of Copiapo—by such plants (Ginkgo-like conifers, ferns, and cycads) as occur in the fossil deposits of this age in Europe and elsewhere, but later on by a tropical flora consisting of many ferns, tree-ferns, large-leaved laurels and Bombaceæ, which distinctly implies a warm and humid climate very different from that which prevails in Chile to-day.

Dr. Reiche seems to accept the theory that this ancient Brazilian flora was in relation with that of India through Africa. It is the descendants of this ancient tropical American flora which still inhabit the coast mountains of middle Chile. These include the Chilian palm, Araucaria, such genera as Ionidium, Peperomia, Abutilon, as well as many Bromeliads and Bignoniaceæ.

Patagonia was even in Tertiary times apparently colder than the neighbourhood of Coronel-Iota, for the coal-mines near Punta Arenas have yielded a flora which is not tropical (Antarctic beech, Araucaria, Flabellaria, etc.). But even to-day the middle and South Chilian forests have a distinctly tropical appearance; they are full of creepers, epiphytes, etc., such as are most unusual in temperate woods. Dr. Reiche explains the affinities of the coastal flora of Chile with Brazil and these tropical resemblances by suggesting that they are an outlying fragment of the original Brazilian flora cut off by the slow and gradual upheaval of the Andes, and subsequently altered by a change of climate.

It is not only in the plants that one finds a resemblance with Brazil or tropical South America, but also in the fauna, for vampire bats, sunbirds, scorpions, termites, and especially two freshwater crustacea (Parastacus and Æglea), occur on both sides of the Andes.

The process of formation or upheaval of these mountains has been, according to Reiche, very slow, gradual, and long continued. They did not exist at all in the Jurassic period; even in Cretaceous times there was much subsidence and encroachment by the sea. But when the cordillera of the Andes did eventually make its appearance, the then existing flora of Chile was cut off from that of tropical Brazil, and much altered by the increasing aridity of the climate.

There are several curious points mentioned in this work which tend to prove that the Andes are very modern, comparatively speaking. Thus the mastodon inhabited the province of Aconcagua and down to Linares in comparatively modern times, as is proved by its bones occurring along with recent molluscs, and even Drimys. Such an animal could scarcely have lived at 4000 metres altitude, as at Ulloma, in Bolivia, where its bones have been discovered.

If one admits that the process of upheaval of the Andes is responsible for the increasing drought of the northern districts of Chile, then it may still be proceeding even now. Dr. Reiche mentions several curious facts which bear upon this last point, as, *e.g.*, a map dated 1765, which represents running water in the pampa of Tamarugal, the existence of malarial fever, remains of the shrub prosopis in the upper layers of the soil, and regulations for the supply of water, which are decidedly unexpected in that arid district. Yet there is subsoil water, though at great depths, and on the whole the argument from these data is not very convincing. Perhaps one should also mention here the interesting observations of glacial action in very unexpected places, as, *e.g.*, at Copiapo, 27° S. lat., at 1300 metres altitude, the Los Andes moraines at 2500 metres, glacial striæ at Curico, 2800 metres, as well as at Linares and Chillan.

But that a dry climate and very high mountains have existed for a very considerable period is very clear from the existence of two other and important constituents of the Chilian flora. These are the Californian contingent, which seems to have travelled southwards in Post-Pliocene times, and the Andine contingent. This last is a very peculiar and remarkable series of dry climate, high Alpine plants, which are for the most part endemic, and are apparently modified descendants of the tropical American flora. They are succinctly described in the biological part of the work, which is of great botanical interest. Perhaps the most curious are the cushionlike tufts composed of short closely crowded branches. There are forty-three of these strange types. Dr. Reiche found that in one of them, *Azorella madreporica*, the twigs were so closely pressed together that a revolver bullet would scarcely penetrate into the plant. This close cushionlike growth is of great importance to the life of the plant. At 1 p.m. in March, the temperature in one of them, *Azorella*, was 21°, whilst that of the sand beside it was 38°. At 6 a.m. next day, when the sand temperature was 3°, that in the plant was 5°. If one compares a climate of this kind with that of a jungle forest, where the ancestors of those Andine forms used to live, it is not surprising that they show remarkable differences.

In the special section dealing with climatology there is, of course, much valuable information, but the difficulty of giving concisely any account of the Chilian climate may be understood if one remembers its extraordinary variations in different latitudes. In the far north there is rain once in five years; in other parts 8 mm. per annum. As one proceeds south almost every transition occurs in the amount of rain until one reaches the Evangelistes lighthouse near the Pacific mouth of the Straits of Magellan, where there is a magnificent rainfall of 3449 mm. every year.

These extracts will be sufficient to give some idea of the importance of Dr. Reiche's work. It is unfortunate that there is only a very short index.

G. F. S. E.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

Marine Meteorology.

'Meteorological Atlas of the Indian Seas and the North Indian Ocean.' Prepared chiefly by W. L. Dallas, under the direction of Gilbert T. Walker, M.A., SC.D., F.R.S., Director-General of Observatories. Simla: Published by the Meteorological Department of the Government of India. 1908.

The Indian Meteorological Department have in this atlas generalized the great mass of observations accumulated for the eleven years 1893–1903 from vessels navigating the Indian ocean and entering the ports of Bombay or Calcutta. The barometers of the ships contributing the information are subject to regular inspection by officials of the department. The wind direction, force, and frequency deduced from the same records, are indicated on the maps, and the mean currents are added not for the same period, but from the monthly weather-charts of what the compiler terms the "English" Hydrographic Office.

The atlas contains four series of charts. The first of these is a set of twelve, showing the Indian ocean to 10° S., with the normal pressure for each month represented by isobars, the wind direction and force for each 4° square, and the average current. The introductory letterpress gives general directions for the use of the charts by ship-masters, and there is a page of description prefixed to each chart, giving a brief but thoroughly practical summary of the normal weather conditions, with notes on the probability of storms. The annual range of pressure and the annual changes of wind direction are beautifully shown as one passes the several maps in review.

The second series of maps includes nine, showing the storm-tracks for each of the months April to December, none of importance being on record for January to March. The tracks of all the principal storms since 1877 have been shown for the Arabian sea, but those recorded in the Bay of Bengal are so numerous that a selection has had to be made. It is remarkable that very few storm-tracks cross India from one sea to the other, the storms of the Bay of Bengal and the Arabian sea having, as a rule, a local origin.

The third and fourth series of charts include ten plates for the Arabian sea and five for the Bay of Bengal, showing the isobars of typical storms, three storms being dealt with for each sea, the isobars of consecutive days being shown. These are extremely instructive, illustrating the comparatively small areas, steep gradients, and very deliberate movement of the storm centre which are characteristic of tropical cyclones. Each storm is described in detail, and the atlas, as a whole, forms a work of reference as valuable to the student of physical geography as it is indispensable to the navigator of the Eastern seas. H. R. M.

The Standard Text-Book on Oceanography.

'Handbuch der Ozeanographie von Dr. Otto Krümmel, ordentlichem Professor der Geographie an der Universität in Kiel.' Band I. Die räumlichen, chemischen und physikalischen Verhältnisse des Meeres. Stuttgart: Verlag von J. Engelhorn. 1907.

In 1884, Prof. G. von Boguslawski published the first volume of a treatise on oceanography in Ratzel's Library of Geographical Handbooks, and the second volume was subsequently prepared by Prof. Krümmel. The work has been out of date for some time, on account of the rapid advance of the science of oceanography, and Prof. Krümmel is probably the only man who has continuously kept pace with the ever-increasing volume of literature on the subject. His periodical digests

in Wagner's *Geographisches Jahrbuch* have been of the utmost service to other students of the subject, and his collection of oceanographical apparatus at Kiel is an epitome of the development of methods and appliances which has been so conspicuous in recent years. There is, therefore, no one so pre-eminently fitted as Prof. Krümmel to bring into systematic form the broad lines of our present knowledge of the science of the oceans, and we welcome his great work with the heartiest appreciation.

Prof. Krümmel spends little space on historical introductions, and indeed that part of the work was done so well in the *Challenger* Reports that it may appropriately give place here to a review of the vast expansion of knowledge resulting from the pioneer expedition, which laid the foundations so broadly and well.

In fixing the place of oceanography amongst the sciences, Prof. Krümmel ranks it as one of the main branches of geography, which he enumerates as chersology, or continental study, oceanography, meteorology, and biogeography. Like the other departments, and like geography itself, oceanography is divided into general and special, the former dealing with the ocean as a whole with regard to space-relationships, the substance of which it is composed, and the energy of which it is the medium; the latter dealing specifically with the peculiarities of the several oceans and seas.

The four long chapters which compose the volume deal comprehensively with the ocean basins, oceanic deposits, sea-water, and sea-ice. The systematic subdivision is carried, in the German fashion, to a high degree of minuteness, to which the most serious fault we can suggest is that the terms are frequently untranslatable into English, and the classifications themselves in some cases are not improved when divested of their German dress. We are far from suggesting that Prof. Krümmel is blind to the work of others than his own countrymen; he is, on the contrary, extremely impartial, and does the fullest justice to the work of all scientific men, fully recognizing the paramount place of British men of science in laying the foundations of modern oceanography, while by no means willing to accept as limitations or dicta of finality the achievements or views of the founders of the science. Oceanography is in a special degree capable of being advanced by international co-operation. Maury started the tradition by his enthusiastic efforts in the fifties of last century, from which meteorology as well as oceanography may be said to have received national embodiment and international support. Sir Wyville Thomson and Sir John Murray developed it by the broad views which united the scientific workers of all nations in working up the *Challenger* collections, and the international co-operation of the nine North Sea and Baltic maritime Powers in the study of North European seas, has in the present day led to advances which in their way are scarcely less epoch-making than those of the *Challenger*.

Prof. Krümmel is by no means content with quoting the work of his predecessors. He has repeated and checked by new methods and with additional data a large number of the measurements and calculations of Sir John Murray and others; he has tested apparatus and experimented with new methods; and by the practical experience thus gained, he sometimes finds it possible to reconcile theories which their promoters believed to be discordant, and to suggest reasonable concessions which save important pieces of original work from the possibility of being mutually destructive.

Detailed analysis or criticism would be out of place here; indeed, the former is practically impossible, because the whole work is so concise and closely knit that a fair idea of it could not be presented in smaller compass, and although there are a few points, such as the great divisions of the ocean in which we are inclined to differ from the author, and a few more in which we might venture to amend his

classifications, these are few indeed compared with the points on which we are in full agreement, and to point them out would give them undue prominence. Taken as a whole, Prof. Krümmel has acquitted himself of an enormously laborious and very difficult task with great acceptance and high distinction, and we look forward with the greater eagerness to the second volume, which we hope will not be long delayed.

H. R. M.

SHORT NOTICES.

Europe.—'La France à Vol d'Oiseau.' By Onésime Reclus. (Paris: Flammarion. [*n.d.*] Two vols. Pp. 556, 559. 10 *francs.*) This is a topographical description of the whole of France, of no great depth, but well classified, according to the old territorial and physical divisions which appear so faintly on most modern maps beneath the coloured network of the modern departments, that they are liable to be forgotten by English students. Yet France is fortunate in the possession of these divisions, which, in usage of this sort, are far preferable to the departments, although these have borrowed physical names. It is to be fully realized, from M. Reclus's writing, how perfectly the French language suits a work of this sort. It would never become tiresome to read.

'La Suisse au XX^{e} Siècle. Étude économique et sociale.' By Pierre Clerget. (Paris: Armand Colin. 1908. Pp. 268. *Maps and Diagrams.* 3 *fr.* 50 *c.*) This review of the economical and social conditions of Switzerland has its chief geographical interest in the first section of the first chapter (which follows a long introduction). Here we find a regional division of Switzerland between the Alps, the Jura, and the plateau, and the significance of this division, and its influence on the population, their languages, customs, etc., is very clearly set forth. It is a most valuable and analytical chapter, assuming a sufficient intimacy of the reader with the country. One may study with interest a diagram showing the movement, according to season, of the inhabitants of an Alpine village, from the high Alps in summer to the valley in winter. Statistics are judiciously used, and their purport carefully explained. Throughout the book authorities quoted are acknowledged.

'Mediterranean Winter Resorts.' By E. Reynolds-Ball. (London: Hazell, Watson, & Viney. 1908. Pp. xxiii., 646. *Map.*) The sixth edition of this well-known work has received notable corrections and additions. The convenience of a single volume (it is actually two volumes in one) which covers a natural region like the Mediterranean littoral so far as its health resorts are concerned, is obvious in contradistinction to guides which are arranged according to political divisions.

'Guide to Greece, the Archipelago, Constantinople, the Coasts of Asia Minor, Crete, and Cyprus.' (London: Macmillan. 1908. Pp. xlix., 226. *Maps and Plans.* 9*s.*) This is another new edition of a well-known guide-book which first appeared under the title of the 'Eastern Mediterranean.' It is a model of clear printing and excellent arrangement, and the high authorities whose names are quoted in the preface should be evidence of its accuracy as regards archæological and other information of a highly specialized character.

Africa.—'Guide to Egypt and the Sûdan.' Fifth Edit. (London: Macmillan, 1908. Pp. xvi., 177. *Maps.* 5*s. net.*) Every new subject appears to have been added to this well-known guide in order to bring its new edition up to date. The journey through the Sudan and Uganda to Mombasa is included.

'A Hausa Reading Book, containing a collection of texts reproduced in facsimile from native manuscripts, arranged for the use of beginners and advanced students, with transliterations into Roman characters; translations, notes, etc.' By

Captain L. Charlton. (London: H. Frowde. 1908. Pp. 83 and 45. *Price* 4*s.* 6*d. net.*) This little book will be a valuable aid to students of the Hausa language. Besides supplying a guide to transliteration from the Hausa script, it carefully elucidates points of grammar by means of footnotes.

'The Congo State: its origin, rights, and duties. The charges of its critics.' By A. Castelein, S.J. (London: D. Nutt. 1908. Pp. 274. *Price* 3*s.*) The author claims to have made an impartial study of the Congo question, his object being "to fix by the light of principles and facts the genesis of the right of sovereignty exercised by the Congo State, as well as the nature of the principal rights and the principal duties which it involves." His conclusions are on the whole favourable to the existing *régime*.

America.—'Journeys of Observation.' By T. A. Rickard. (San Francisco: Dewey Publishing Co. 1907. Pp. xvi., 255, 130. *Illustr.*) This sumptuous volume, beautifully illustrated, "records the observations made by a traveller, who happened to be a mining engineer." It is divided into two parts, the first dealing with Mexican mines, the second with south-western Colorado. The primary interests are mining and mineralogy, but these so closely involve topographical and geographical studies that the book is capable of appeal to non-technical readers.

General.—'The Camper's Handbook.' By T. H. Holding. (London: Simpkin, Marshall. 1908. Pp. 400, with appendix and index unpaged. *Illustr.* 5*s. net.*) A handbook on camping is no doubt liable to rough usage, and the poor appearance of this book is justifiable on that ground. But the matter appears excellent, and it would be difficult to believe that any conceivable aspect of camping as a recreation, or any subject connected with it, is omitted.

THE MONTHLY RECORD.

EUROPE.

Diminution of the Mer de Glace.—While the data respecting the advance or retreat of glaciers are usually restricted to a measurement of their longitudinal variations, exact measurements of the "ablation," or fall of level of the Mer de Glace, have been made during the past fifteen years by M. J. Vallot, who gives a note on the subject in the *Comptes Rendus* of the Paris Academy of Sciences for June 22, 1908. By a study of the moraines, and by inquiry among the inhabitants of the neighbourhood, he has also made an approximate estimate of the amount lost since 1850, the date of the last maximum. It appears that in the case of four cross-sections, between the altitudes of 1550 and 1920 metres, the mean fall of level in a period of thirteen to fifteen years has varied between 11 and 29 metres, the greatest amount of course corresponding with the lowest altitude. The actually ascertained fall of level in the above-named period seems to bear a proportion of from 20 to 40 per cent. to the total since 1850. In the comparatively level portion between the Echelets and Montanvert there has been an approximate ablation of over 50 metres in the fifty-seven years 1850–1907. This being about one-eighth of the total which has occurred since the glacial epoch, M. Vallot asks whether much that has been said on the subject of the latter may not have been considerably exaggerated.

The Plant Formations of the Færoes.—In Part III. of 'The Botany of the Færoes,' published at Copenhagen with the aid of the Carlsberg Fund, Mr. C. H.

Ostenfeld gives an interesting account of "The Land Vegetation of the Færoes," dealing both with the general relations of the vegetation to external conditions, and with the special plant-formations represented. The paper has also been issued separately (Copenhagen: H. H. Thiele, 1908). Foremost of the natural conditions affecting vegetation is of course climate. In the Færoes the variations of temperature are remarkably small, for there is no excessive cold in winter, while in summer again the temperature is rather low. The abundant humidity, both of the air and soil, renders special adaptations to drought unnecessary. Few data have hitherto been available respecting the snow-covering, but some careful observations by Dr. Knud Poulsen during the two winters spent at Thorshavn enable Mr. Ostenfeld to present a sketch of the general conditions, which brings out the fact that, in the lower grounds at least, the snow never lies long, the prominent feature being the frequent and rapid changes between snow, thaw, and black frost. The snow-covering, therefore, does little to protect the vegetation. On the other hand, the influence of the wind is great, both in its dwarfing effect in the plants (especially in the wind-swept depressions called "Eider"), and, sometimes in the entire removal of the surface covering of soil. Owing to the frequency of fog, the general cloudiness, and the low angle of incidence of the sun's rays, the plants do not enjoy a large amount of light, though in the absence of forests they get the benefit of all that is available. Exposure plays an important part in differentiating the formations. The soil, formed by the decomposition of basalt, is generally favourable to plant growth. Owing to the abundant moisture, peaty soil plays an important part. Altitude is of less importance in the Færoes than in many countries, as, owing to the temperate insular climate, the more common mountain plants can also thrive in the lowlands. True mountain plants only amount to about one-ninth of the total, while the lowland flora comprises about two-thirds of the whole. In defining the formations, Mr. Ostenfeld distinguishes, firstly, between natural and cultivated formations; secondly, between halophile and inland; and thirdly, between formations of the lower regions and of the mountains. Over twenty in all are described, some of which are further subdivided in considerable detail. The cliff formation, *e.g.*, includes a series ranging from the vertical cliff-wall with its covering of lichens to the sheltered "gjov," or ravine, with its terraces luxuriantly clothed. On the mountain plateaux the most widely distributed formation is that of the rock-flats, barren expanses in which the rocks stand out like islets in a sea of gravel, relieved here and there by a few plants. In the cultivated area the most important formation is that of the "bö," or grass meadow, the process of formation of which is described in detail. New land is generally first planted with potatoes for two years, barley (or rarely oats) being sown the third year, mixed with a small quantity of grass seed. After this the meadow with a wealth of flowering herbs is gradually developed, the perennials ousting the annual weeds which appear in the early stages.

The Geography of the Steigerwald is the subject of a monograph by Dr. J. Schwender in the *Forschungen zur deutschen Landes- und Volkskunde* (vol. 17, No. 1). The existing aids for such a study were fewer than in the case of some regions, and the author is to be congratulated on the amount and value of the material he has amassed in two months' wanderings in the region, the results of which he has supplemented by a careful use of cadastral maps. A history of the course of settlement, contemplated in the original plan, had to be abandoned, while it was not possible to show the altitudinal contours on the maps. Falling within three administrative districts, the upland called the Steigerwald runs north-north-east between the Main, Aisch, and Regnitz rivers in Franconia. On the west and north it falls away steeply to the Main. On the south and south-east it is bounded by the Uffenheim depression and the Aisch river. Further north the

eastern frontier, in the absence of a determinate geological or orographical boundary, is somewhat arbitrary. Leaving the Aisch valley at Ühlfeld, it runs north *viâ* Wachenroth, etc., to Ross-stadt on the Main. Substantially within these borders, but with occasional slight projections and recessions therefrom, the Steigerwald constitutes a well-defined, compact region of fully 550 square miles, with but 73,536 inhabitants. Leaving out the forest area, 35·4 per cent. of the whole, the population on the plain still amounts to only 205 to the square mile. Corresponding to its geological history, the Steigerwald consists of (1) the wall-like edge on the west and north-west, with the level land fronting it; (2) the eastern declivity, shelving off slowly eastwards and intersected by numerous streams. The higher border presents no striking elevations or depressions, but its middle part, 1500–1600 feet high, is marked by such summits as the Geiersberg, Schlossberg, etc. The southern border from the Schwanberg (1580 feet) to the Frankenberg (1460 feet) shows greater variations. Like its main divisions, the Steigerwald as a whole splits naturally into a north, middle, and southern section. Its waters all flow north, west, and east, direct or by the Regnitz to the Main. The chief watershed, running at a nearly uniform height from south-south-west to north-north-east, is pierced by the Rauhe Ebrach and an affluent of the Bibart, both descending from the western slope. Economically, the Steigerwald comprises agriculture, cattle-rearing, and forest culture, 44·2 per cent. of the total area being arable, 9·8 per cent. meadow, and 3·1 per cent. pasture land. Increasing in area from north to south, the arable land is most extensive in the good level soil of the south, wheat being its chief crop. The north part, on the east as on the west side, has the least percentage of agriculture, but viticulture is a prominent feature. Cattle-rearing is well developed both as regards the number and quality of the stock, but less in the west than on the eastern slope. Forest culture is the next most important source of revenue. Clear and precise tables show the respective areas of the north, middle, and south parts of the Steigerwald; their distribution in plough land, vineyard, meadow, forest, etc.; and their respective stocks of horses, cattle, sheep, swine, and goats. The bulk, however, and most interesting part of the monograph is that concerned with the anthropogeography.

ASIA.

The Baghdad Railway.—The construction of a new section of this railway—from the present terminus at Bugurlu, a little beyond Eregli, to Helif, in northern Mesopotamia—is provided for by an agreement arrived at early in June between the Anatolian Railway and the Turkish Government. Bugurlu lies at the north-western foot of the Taurus, the crossing of which range, and especially the descent to the plains on the southern side, will involve considerable engineering difficulties. From a note in *Globus* (vol. 94, No. 2), we learn that thirty tunnels will be necessary on this section. After skirting the Bay of Alexandretta, the line will cross the Amanus, and at Tel Habesh, 50 miles north of Aleppo, will eventually be connected with the line under construction by a French company from Damascus to Aleppo. Hence it will be continued eastward, crossing the Euphrates south of Birejik, and reaching Helif, south of Mardin, by way of Harran.

The Hejaz Railway.—Reference was made to this important undertaking in the *Journal* for 1906 (vol. 27, p. 633). The second part of the memoir descriptive of the line, by Auler Pasha, has now been issued as Ergänzungsheft No. 161 to *Petermanns Mitteilungen*. It is illustrated with numerous photographs, which give characteristic representations of the remarkable country through which the railway runs, and a map showing the course of the line itself, on a fairly large scale, from Ma'an to El 'Ula, and another in outline of the old trade routes which centuries

ago traversed Asia Minor, Arabia, and Mesopotamia. The entire length of the Hejaz line, as far as completed, from Damascus to El 'Ula, is 980 kilometres, and roughly this may be said to be three-quarters of the entire distance from Damascus to Medinah. From Medinah to Mecca two lines would appear to have been in contemplation, but that hugging the coast is the one finally decided upon. It is expected to be completed in 1910, and the length will be about 450 kilometres, or 281 miles, according to a report made by the engineer, Haji Muchtar Bey, who followed the pilgrim route from Medina to Rebigh on the Red sea, and thence to Mecca. He further states that there are no special difficulties in the shape of mountains or rivers. Auler Pasha's monograph makes interesting reference to the work and discoveries of previous explorers in these regions, particularly Charles Doughty, Hüber, and Euting. The researches of these proved that the old trade route between East and West, in some respects coinciding with the trend of the new railway line, brought the products of China, the Moluccas, and East Indies, gold from the Zambezi, frankincense from South Arabia, etc., on camel-back through two intermediate sets of hands on its way to the north: (1) In the southern section of the route from Cane Emporium in southern Arabia to El 'Ula, through the hands of the Himyarites or Sabæans; and (2) in the northern section from El Hejr, past Ma'ân, to Petra, through the hands of the Nabatæans. From the last-mentioned emporium the caravans separated, some going west to Gaza and Alexandria, and some northwards to Damascus and thence to Byzantium. This was the chief commercial route between 800 B.C. and 109 A.D., in which year Trajan's general, Cornelius Palma, made a cruel end of the Nabatæans, and the trade of Eastern Asia diverged towards the Persian gulf, and thence across the desert to Palmyra. Auler Pasha entertains no doubt that El 'Ula was the northernmost trading station or factory of the Sabæans, and El Hejr the southernmost of the Nabatæans. The author adds that it is a most interesting coincidence that, after an interval of nearly 2000 years, these two great historic highways of commerce should be in process of being revived and reorganized, that of the Sabæans and Nabatæans through the Hejaz railway, and that of the Persian gulf, Palmyra, and Byzantium through the Baghdad railway. It is necessary to point out that in the general map illustrating the whole region from Damascus to Mecca, the parallels of latitude are marked wrongly, the effect being to throw the position of any place one might wish to fix or refer to 2° too far south.

Dr. Sven Hedin.—No direct news from this traveller appears to have been received in Europe since the end of last year, when letters despatched from Gartok early in October reported his intention of starting immediately for Ladakh and Khotan (*Journal*, vol. 31, pp. 216, 333). Some anxiety seems to have been felt in Sweden owing to the absence of news, but a telegram dated Simla, July 29, reported that a caravan from Lhasa had arrived at Leh, bringing a letter written by one of the explorer's servants, which stated that he himself was well, and his caravan in good condition. No information as to his movements was, however, given.

AFRICA.

The Duke of Mecklenburg's Expedition across Africa.—The Duke of Mecklenburg has returned to Germany after successfully completing his expedition to the West Coast by way of the Congo (*Journal*, vol. 31, p. 445; 32, p. 86). Further accounts of the experiences of the Duke and his companions are given in the *Deutsches Kolonialblatt*, July 15, 1908. During the land journey to Avakubi, where regular navigation of the Uruwimi begins, another okapi skin was obtained from the Mombutti dwarfs. In addition to the names Okapi (or

Kwapi) and Kenge, which are most commonly used for the animal, the name Alabi was also heard. "Kenge," which was not heard till Irumu was reached, is applied in some districts to the "soli," the great striped antelope, of which a specimen had been previously secured (*ante*, p. 87). A fine collection of birds was obtained, as well as many specimens of invertebrates and interesting forms of fish from the Ituri; but after the river journey had been begun at Avakubi the fauna became much scarcer. Whereas at Beni and the districts bordering the forest on the east, the months from February to May are considered the wettest, in the Ituri forest the greatest precipitation is said to occur between August and October. The voyage down the Aruwimi was made at the time of the lesser rains (end of April), and the river, of which the breadth varied from 400 to 1000 yards, had risen in consequence some 3 feet. The cataract at Panga, which is impassable by boats, presented an imposing spectacle. A report by the geologist, Dr. Kirschstein, who had remained behind to complete his study of the volcanoes, records a serious disaster to his party on Karisimbi. During an ascent in February he had discovered a previously undescribed crater, about a mile in diameter, on the south-east side. He was preparing to descend the mountain, when his party was assailed by a furious snowstorm, to which half of his men succumbed—the fatalism of the negro making it impossible to induce them to struggle on to a place of shelter. Some of the earlier reports of the scientific experts, printed in the *Mitteilungen a. d. Deutschen Schutzgebieten* (1908, No. 2) may here be referred to. Among the pieces of work accomplished by the topographer, Lieut. Weiss, was the trigonometrical and topographical survey of the region of the Kagera, etc.; a large number of astronomical observations at Kissenye on Lake Kivu; and a detailed survey of the region of the volcanoes. The new volcano near the north end of Kivu, which originated in May, 1905, was ascended in company with Dr. Kirschstein, and its position and topography determined. Dr. Schubotz, the zoologist, gives some interesting notes on the faunal distribution, the regional variation of forms having been studied with much care. Some of the results were unexpected, especially as regards the fauna of the waters examined. *Hirudineæ* and *Turbellariæ* were observed in great numbers, and *Planariæ*, which Stuhlmann had found in none of the streams flowing to the Nile, were obtained in plenty in the head-streams of the Kagera, but not in Kivu. The general poverty of the fauna of this lake points to its recent origin. On Karisimbi traces of mammals (elephant, leopard, etc.) were seen up to 4000 metres (over 13,000 feet), while birds were not found above 3500 metres. The volcanoes form a marked dividing line between the regions on either side, a typical steppe-fauna, remarkably rich in antelopes, making its appearance to the north. In the eastern part of the Congo forest howling monkeys, parrots, turacos, etc., are much in evidence, and the character of the fauna already shows its West African affinities. Lastly, Dr. Mildbread's report gives details respecting the flora of the volcanoes and of the eastern Congo forest. Of the former, distinct differences seem to exist between the individual peaks. Niragongo, *e.g.*, seems marked by a scarcity of bamboos, forests of which clothe the base of the others.

Explorations in the Kamerun.—Baron von Stein, whose journeys in the Kamerun during the past dozen years have donè so much to throw light on the interior of the territory, has lately carried out another important expedition through some of the little-known districts on the upper Sanaga and between this stream and the Wuri. Starting from the Yaunde station in January, 1907, the traveller went north by a hitherto unsurveyed route through the habitat of the Mpangwe peoples, crossing the hilly zone forming the water-parting between the Nyong and the Sanaga, and entering a more level country, which begins to show more of the

character of the grass-lands to the north. From the district of the Etun (one of the Mpangwe group of tribes), the expedition entered that of the Baki, who speak a different language from the Mpangwe, and showed themselves more or less hostile. They are rather fishers than hunters, and show much skill in the building of canoes. The Sanaga, which was crossed a little above the mouth of its northern tributary, the Mbam, is much more obstructed by falls and rocks than the Nyong, at the same distance from the coast. A good deal of gallery forest is found in this region. Baron von Stein ascended the Mbam, which had previously been imperfectly known for some distance to the north, crossing its tributary the Njim with some difficulty. The expedition now met with increased difficulties, desertions of porters being a constant occurrence, and this state of things continued during a great part of the journey. The Mbam was crossed near the Garima falls, and the little-known Bafia country was then entered. The Bafia people showed much distrust, and hostilities were avoided with difficulty. Their country differs a good deal from other districts. In the east and south-east it is flat, but in the north and west it is mountainous. It is generally thickly peopled, and the people differ much from their neighbours in speech, manners, and customs, showing more resemblance with those of the north of the Kamerun. It was impossible to continue the westerly march in the desired direction, midway between the Sanaga and the route of Lieut. Schimmelpfennig some years previously, and it was necessary to bend southward to the Sanaga, afterwards returning north near the frontier of the Bakoka peoples. On reaching this a sudden change took place in the country, from plain to mountain, and from grass-land to forest. The cultivation of oil palms was observed, and landolphias and kicksias were seen. Elephants seemed still fairly abundant. The zone of Mohammedan influence was here left, and the people were easier to deal with. The going, however, was very bad for the porters, though progress became more rapid when the forest region proper was reached. The valleys of several tributaries of the Sanaga were crossed, and the upper basin of the Dibamba, which had previously been almost unknown, was entered. One of the main upper branches is the Ebo, which has hitherto been confused with the Ekem. The middle course of the Dibamba, below the junction of the various upper branches, is much broken by falls. Hereabouts the influence of the Duala traders from the coast began to be observable, and progress became easier. As a result of the expedition it is probable that they will extend their operations still further eastwards, not altogether, perhaps, to the benefit of the indigenous populations. According to the traveller's reports, a good deal remains to be done before the regions traversed can be successfully brought under control.

Minerals in Northern Nigeria.—The results of the mineral survey of Northern Nigeria during the years 1904–6 are given in *Colonial Reports—Miscellaneous*, Nos. 46 and 47. In Bassa province is a band of metamorphic rocks, adjacent to the Niger, not more than 5 to 6 miles wide, stretching from Kpata to Itobi, in which pegmatites are of frequent occurrence. They contain mica, but in plates too small to be of economic value. At Igbo, within a mile of the river, there are bands, 3 to 4 feet thick, of crystalline limestone likely to prove valuable as a source of lime. Ironstone concretions occur in the Bassa ferruginous sandstone, but too sporadically to be of value as an iron ore. In Kabba province iron ore appears to abound, occurring as masses of magnetite near Anom, and limonite of sedimentary origin in the neighbourhood of Lampechi. In the concentrates obtained from the stream deposits rich samples of monazite are occasionally found. The rocks (mostly crystalline), of Illorin province, constitute a westerly extension of the rocks of Kabba province. Monazite is occasionally traceable in the stream deposits of Illorin, and a small stream near Aictu shows a notable quantity of it. Nupe province is

in greater part covered by reddish grits, and discloses no minerals of economic importance. In Nassarawa province magnetite abounds in the stream deposits east of Abuju. Monazite is also traceable among the stream deposits. It becomes more abundant in the vicinity of Aribi, and is noticeable in the river Gurara at Gantam, while further north there are indications of its wider distribution. Much iron is made by the natives in the Koro and Jaba countries from concretionary iron ore. A specimen of talc was found near Lampai. Altogether, monazite is very widely distributed in the Protectorate, but it has yet to be seen whether there are natural deposits rich enough to repay exploitation. Limonite ores, easy to quarry, at Akwa, Ojerami, and Jakura, 30 miles from the Niger, contain 54 to 56 per cent. of iron. West of Kuka and 70 miles from Lake Chad is an area of about 500 square miles, partly in French territory, containing earth from which salt—"ordinary" and "Sherri" manga—is extracted. Vegetable salt is also obtained from the ash of *Salvadora persica*, common on the banks of Lake Chad. The most important sources of salt are the springs at Awe, Azari, etc.

The Southern Railway in German South-West Africa reached its terminus at Keetmanshoop in June last, and though a good deal remains to be done before the line is completely finished, it is now possible for traffic to be carried on in a provisional way. The line, which leaves the coast at Lüderitz bay, was begun in December, 1905, the first section of 140 kilometres being provisionally opened to traffic in October, 1906. The total length is 366 kilometres, or about 230 miles.

AMERICA.

The Canada-United States Boundary.—By a treaty signed at Washington on April 11, 1908, and ratified on June 4 following, provision has been made for the demarcation anew of the frontier between Canada and the United States throughout its whole length. The treaty treats of the boundary in eight different sections, the procedure to be adopted varying somewhat according to the special circumstances of the several cases. Thus while in some cases the line has long been definitely marked by monuments, in others it has merely been laid down on charts, while in others, again, some doubt exists as to the precise line which ought to be followed. In certain cases steps have been taken within recent years to complete the demarcation, and the commissions which have been charged with the work will continue to act. As a general principle, it is recognized throughout that the decisions arrived at by previous treaties, from 1783 onwards, are to remain valid, while in cases of doubt as to the intentions of these, attention is to be paid to action by either Government or by local governments on either side of the line which may tend towards their interpretation. Deliberate rectifications of frontier to the advantage of either party are thus almost entirely excluded, and possible deviations from the strict letter of previous agreements are practically limited to cases where the course of the line has been established by mutual recognition and acquiescence. In the case of six out of the eight sections, the work of survey and demarcation is entrusted to two expert geographers or surveyors, one for each contracting party, but it is understood that the same persons will be appointed for the whole of the operations, unless there shall appear, in any case, to be a special reason to the contrary. For the section between the intersection with the St. Lawrence and the mouth of Pigeon river, on the western shore of Lake Superior, the re-establishment of the boundary is left in the hands of the International Waterways Commission; while as regards the boundary from the summit of the Rocky mountains to the Gulf of Georgia, the work will be done by the commissioners already designated by concurrent action of the two Governments in 1902 and 1903. In all cases the

line adopted is to be laid down in quadruplicate sets of accurate modern maps or charts, and the work done by the commissions to be described in duplicate in a joint report. It is unnecessary here to describe the special provisions for the separate sections, but attention may be called to one or two cases in which the acceptance of a definite line may involve difficulties. In Passamaquoddy bay, the commissioners appointed under the treaty of 1892 failed to agree in respect of a small part of the line on either side of Lubec Narrows channel, and the possibility of a similar disagreement during the procedure under the present treaty is provided for. In this, as in other possible cases of dispute, the decision is to rest with an arbitrator, to be appointed either by a third Power agreed upon by the two parties, or jointly by two Powers to be selected by the two parties respectively. As regards the St. Croix river, the centre of which forms the boundary from mouth to source, a difficulty may arise in the case of divergent branches forming islands in its course. The national character of such islands already established will determine the branch to be followed, but where this is in dispute, recourse may again be had to arbitration. A somewhat similar state of things exists in the case of the boundary between Lake Superior and the Lake of the Woods, which again follows waterways, and which has never been actually located or monumented by joint action of the two Governments.

Exploration in Dutch Guiana.—During the past eight years a succession of expeditions have been carried out, under the auspices of the Royal Netherlands Geographical Society in association with other bodies, for the scientific exploration of the interior of Dutch Guiana. Several of these have from time to time been referred to in the *Journal*. A concise statement of the work accomplished by the several expeditions, with the names of the leaders and references to the published accounts, is given in the *Tijdschrift* of the Netherlands Geographical Society for May last. As a rule, each expedition has taken in hand the examination of one or more of the various river systems of the colony (Koppename, Saramakka, Gonini, Tapanahoni, etc.), while attention has also been paid to ethnographic and other research. The expedition of 1907, in the direction of the Tumuc Humac range, has been described in the same *Tijdschrift* for January of this year. The leader was Mr. C. H. de Goeje, and it may be regarded as having completed the work of the Gonini and Tapanahoni expeditions. Still another expedition has been despatched during the present season, under the command of Lieut. Eilerts de Haan. Its field of action is at the opposite end of the colony to that of 1907, viz. the almost unknown south-west corner, where the upper basin of the Surinam river and the mountain range which forms its watershed need to be explored. The exploration of the upper Corentyn, on the frontier of British Guiana, will perhaps be the task of yet another expedition.

AUSTRALASIA AND PACIFIC ISLANDS.

Expedition to the Southern Islands of New Zealand.—The various small islands in the ocean south of New Zealand possess a considerable interest from the point of view of biological distribution from the fact that they form part of the few and small land areas which exist in the zone of transition between the temperate and Antarctic regions. Some interesting facts respecting their botany, collected by Dr. L. Cockayne during a winter expedition in 1903, were referred to in the *Journal* during 1905 (vol. 25, p. 461). Further research in this direction, as well as in other branches of science,* was carried out at the end of 1907 by an expedition, in which Dr. Cockayne once more took part, undertaken under Government auspices,

* Magnetic observations were one of the chief objects.

in association with the Canterbury Philosophic Society. Extracts from narratives published by the New Zealand press have lately appeared in the *Kew Bulletin* (1908, No. 6). The voyage was made in the *Hinemoa*, Captain Bellons, one of the vessels which periodically visit the islands in search of castaways (wrecks on their coasts being no uncommon occurrence), and the scientific experts were divided into two parties, one for the Aukland, and the other for the Campbell islands. One of the narratives is by Captain Dorrien Smith, a member of the former party. After touching at Port Pegasus, near the south end of Stewart island, the *Hinemoa* visited the Snares, 60 miles to the south-west, and the writer gives some interesting notes on the flora and fauna of these wind-swept islets, surrounded by the wide expanse of the Southern Ocean. They are composed of basalt rising some 500 feet, with precipitous cliffs. A large part of the surface is covered with semi-prostrate scrub, and there are in all only about thirteen species of plants on the islands. Bird-life is, however, described as wonderful, and it includes many flightless forms, specimens of which were captured by means of a long-handled landing-net. At the Auklands, the survivors of a shipwrecked crew were rescued, and a vivid description is given of their adventures and sufferings on Disappointment island, where the four-masted barque *Dundonald* had been wrecked on March 7, 1907. Carnley harbour is described as magnificent, and the scenery as very fine, the hills rising abruptly to 2000 feet. The "Rata" (*Metrosideros lucida*) dominates the lower zone, above which the tussock grass (*Danthonia*) and *Suttonia divaricata* are prominent, the *Suttonia* being almost impenetrable. *Olearia Lyalli* (which was common on the Snares) seems to have been almost choked out by the Rata. The birds (petrels, shags, etc.) were remarkably tame. The geologists made discoveries of ancient sedimentary rocks, which are important as supporting the belief in the former existence of a great sub-Antarctic continent. Extracts from Dr. Cockayne's narrative supply a further account of the Snares, besides summarizing the general characteristics of the vegetation of the southern islands. This observer points out that the character of the flora and fauna (which include forms of very limited distribution) agrees with the notion that the islands are scanty remnants of a once greatly larger land area. Reproductions of photographs by Captain Dorrien Smith, illustrating the flora, are given.

POLAR REGIONS.

Dr. Charcot's Antarctic Expedition.—The French expedition to Antarctic regions, under the command of Dr. Charcot, left Havre on August 15 in the *Pourquoi Pas*. Dr. Charcot expects to be absent about two years. One of his objects in returning to the regions of the South Pole is to bring back specimens of the fossils to which Dr. Nordenskjöld has already directed attention. He intends to transport them to one of the open ports of the Antarctic continent, either Port Lockroy or Port Charcot, and then to go on to Loubet Land to begin his exploration of the regions to the south. He has taken with him provisions for twenty persons for more than two years. The *Pourquoi Pas* is expected to arrive face to face with the southern ice about December 15, at about 800 kilometres south of Cape Horn. Six automobile sleds will, it is hoped, enable the expedition to make its way well into the interior along the glaciers, and supplement the services rendered by the skis.

The Erichsen Expedition to East Greenland.—We regret to state that a serious disaster has occurred to this expedition, which, it will be remembered, set out from Copenhagen in June, 1906, for the purpose of exploration on the unknown part of the Greenland coast north of Cape Bismarck, and research in the adjoining region. The surviving members of the Expedition arrived at Bergen on August 15,

and Lieut. Trolle, master of the *Denmark*, the vessel of the expedition, has given particulars of the lamentable death of the leader and his two companions. It appears from a Reuter message that a harbour for the ship was found in latitude 76¾°. Mr. Erichsen, Lieut. Hagen, and Mr. Brönlund perished in November, 1907, in an attempt to return from the north coast of Greenland over the inland ice, having been obliged to remain on the north coast through the summer, owing to the state of the weather. A sledge expedition was organized in the spring of 1907, under the command of Mylius Erichsen, to explore the unknown part of the north-east coast of Greenland. The expedition consisted of ten sledges in four batches. Three of these returned before the beginning of summer, and in September, 1907, an expedition was sent out to find the fourth party, which had not returned. At 80° the expedition found open sea close to the coast. In the course of the autumn numerous sledge expeditions started, and in March, 1908, a fresh rescue party set out, which brought back definite news of the fate of the missing sledge party. During the spring several other sledge journeys were made on the inland ice towards the south, as far as Ardencaple. The coast of Greenland was explored as far as Cape Bridgman, 83½°, and into Peary channel to Cape Glacier. The coast line took a much more easterly direction than was expected, and connection was made with Peary's landmark on Peary Land. At Cape Glacier the Danish flag was hoisted, and the country taken possession of for Denmark, and called King Frederic VIII. Land. No living people were encountered. Scientific expeditions were continuously made into the district surrounding Port Denmark, and also from the ship. On the road large collections were made, and a mass of scientific material was collected; numerous sketches, paintings, and photographs of the country were also made.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

Cones formed by Melting Snow.—Examples of a peculiar surface form, due in part to the melting of snow, are described from Iceland and the Alps respectively by Herr Spethmann and Prof. Brückner in the *Zeitschrift für Gletscherkunde*, vol. 2, pt. 4. The resemblance of the fields of snow-cones, of which photographs are given, to the *nieve penitente* of tropical regions is sufficiently great to suggest a similar origin, though this is not pressed by either of the writers; in fact, Herr Spethmann considers the phenomenon in Iceland to be not entirely analogous with that in the Alps even. The fields which he observed during his recent expedition to Iceland (cf. *Journal*, vol. 31, p. 672) consisted of cones varying in height from half an inch to about 18 inches, and were covered with a layer of volcanic dust, etc., which quite concealed the consolidated snow beneath. They occurred on level or gently sloping ground, and appeared to be in no way dependent on the orientation of the latter. The angle of slope of the individual cones sometimes reached 45°. From the fact that, where not covered with earthy matter, the snow showed few, if any, irregularities, Herr Spethmann concludes that the cone formation is entirely due to the deposition of the dust by the wind and the development on its surface of ripple marks, which lead to a differential melting of the snow beneath. Prof. Brückner's example is from the Rhone glacier, and shows equally the effect of an original ripple-marking of a layer of dust above the snow.

GENERAL.

The Cartographer Tomas Lopez.—A biography of this Spanish cartographer, embodying the results of much original research, and affording an interesting glimpse into the development of cartography in Spain, has been supplied by M. G. Marcel in the *Revue Hispanique* (vol. 16), in a paper since separately published (New York, Paris: 1907). The biography is supplemented

by a list of the maps of Lopez, including many maps not entered in Colonel Prudent's list (in the *Annales de Géographie*, November 15, 1904) of the maps constituting Lopez' atlas. Born at Madrid December 21, 1731, Lopez, under favour of the Prime Minister of Spain, passed, in 1752, through a course of mathematics in the Imperial College, and the same year, under the administration of Spain's large-minded statesman, was, with three other youths, sent to Paris to learn the art of engraving maps. In Paris he completed three courses in mathematics, attending the lectures of Abbé de la Caille, frequenting the studio of D'Anville, where probably he made the acquaintance of Guillaume Delahaye, D'Anville's engraver. In Paris, where he resided till 1760, Lopez brought out a series of maps of no especial merit, and, returning to Madrid, published, in 1761, maps of Jaen, Granada, and Cordova, and in 1762 (*inter alia*) an Atlas of Spain and Portugal, and a map of Louisiana (then being ceded to Spain). Of more importance was a work published in 1763—'Descripcion de la provincia de Madrid'—a volume of over 200 pages, with a map designed after the great map of P. P. Martinez and de la Vegá (1739-43). This great map was long held for lost, but a manuscript copy, measuring 7 feet each way, and presumably from the hand of Lopez, was produced at a meeting of the Madrid Geographical Society in 1904. M. Marcel, who was present at the meeting, communicates some interesting details respecting the map, discussing also the question who were the two original authors. The succeeding years, down to his death in 1802, are crowded with Lopez' labours, testifying to a remarkably expeditious and indefatigable industry. Out of the long list of his productions may be cited his 'Principios Geográficos aplicados al uso de los Mapos.' The second volume, not appearing till eight years later, includes an elucidation of the mariner's compass and its deviations, loxodromic lines, hydrographic maps, ancient measures, etc. About 1776, Lopez addressed a set of questions to the ecclesiastical functionaries, and another set to the intendants of Spain, with a view to the collection of information to be embodied in a geographical dictionary of Spain. These are given in an appendix. The general conclusion reached by M. Marcel is that, though not a geographer of the first rank, Lopez' services to the science are incontestable.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By EDWARD HEAWOOD, M.A., *Librarian*, R.G.S.

The following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full :—

A. = Academy, Academie, Akademie.
Abh. = Abhandlungen.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Col. = Colonies.
Com. = Commerce.
C.R. = Comptes Rendus.
E. = Erdkunde.
G. = Geography, Géographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
Iz. = Izvestiya.
J. = Journal.
Jb. = Jahrbuch.
k.k. = kaiserlich und königlich.
M. = Mitteilungen.
Mag. = Magazine.
Mem. (Mém.) = Memoirs, Mémoires.
Met. (mét.) = Meteorological.
P. = Proceedings.
R. = Royal.
Rev. (Riv.) = Review, Revue, Rivista.
S. = Society, Société, Selskab.
Sc. = Science(s).
Sitzb. = Sitzungsbericht.
T. = Transactions.
Ts. = Tijdschrift, Tidskrift.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.
Zap. = Zapiski.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

A selection of the works in this list will be noticed elsewhere in the "Journal."

EUROPE.

Alps. **Coolidge.**

The Alps in nature and history. By W. A. B. Coolidge. London: Methuen & Co., [1908]. Size 9 × 5½, pp. xx. and 440. *Maps and Illustrations. Price 7s. 6d. net. Presented by the Publishers.*

Instructive studies of the physical and historical aspects of the Alps as a whole.

Alps. **Dübi.**

Conway and Coolidge's Climbers' Guides. The Bernese Oberland, vol. 4. Grimsel to the Uri Rothstock. By H. Dübi. 2 parts. London: T. Fisher Unwin, 1908. Size 5½ × 3, pp. (part 1) xx. and 112; (part 2) xxiv. and 132. *Price 10s. net each part. Presented by the Publisher.*

The guides belonging to this series are too well known to need a recommendation.

Alps. **Whymper.**

The Valley of Zermatt and the Matterhorn. By Edward Whymper. 12th edit. Chamonix and the range of Mont Blanc. By the same. 13th edit. London: J. Murray, 1908. Size 7½ × 5, pp. (Zermatt, etc.) xvi. and 224; (Chamonix, etc.) xvi. and 206. *Maps, Plans, and Illustrations. Price 3s. net per vol. Presented by the Publisher.*

Europe. **Brachelli and Juraschek.**

Die Staaten Europas. Statistische Darstellung begründet von Dr. H. F. Brachelli. Fünfte Auflage . . . herausgegeben von Dr. Franz von Juraschek. Leipzig, etc.: F. Irrgang, 1907. Size 9 × 6, pp. vi., 996. *Price 24s.*

This standard work has been recast so as to suit the requirements of modern conditions.

France. **Miltoun.**

Castles and chateaux of Old Navarre and the Basque Provinces, including also Foix, Roussillon, and Béarn. By Francis Miltoun. London: Sir I. Pitman & Sons, 1908. Size 8 × 5½, pp. xviii. and 456. *Map and Illustrations. Price 7s. 6d. net. Presented by the Publishers.*

Germany—Berlin. **Baedeker.**

Berlin and its environs: handbook for travellers. By Karl Baedeker. 3rd edition. Leipzig. (London: Dulau & Co.), 1908. Size 6½ × 4, pp. x. and 248. *Maps and Plans. Price 3s. Two copies, presented by the Editor and Publishers.*

Italy—Venetia. **Magrini and others.**

Reale Istituto Veneto di Scienze, etc. Ricerche Lagunari, per cura di G. P. Magrini, L. de Marchi e T. Gnesotto. No. 8, Osservazioni mareometriche lungo il litorale e in laguna (biennio 1906–1907) (pp. 52); No 9, Impianti mareografici eseguiti (pp. 18); No. 10, Operazioni geodetiche fondamentali per il relievo della città e laguna di Venezia eseguite dall' Instituto Geografico Militare, per incarico del Municipio di Venezia (pp. 64). Venice, 1908. Size 10½ × 7. *Diagrams and Illustrations.*

Norway—Glaciers. *Z. Gletscherkunde* **2** (1908): 213–219. **Machaček.**

Ueber Rückzugsmoränen in Norwegen. Von Fritz Machaček.

Russia. **Philippson.**

Landeskunde des Europäischen Russlands nebst Finnland. Von Dr. Alfred Philippson. Leipzig: G. J. Göschen, 1908. Size 6 × 4, pp. 148. *Maps and Illustrations. Price 80 pf. Presented by the Publisher.*

One of the excellent series of handy geographical treatises known as the "Sammlung Göschen."

Russia—Finnland. **Scott.**

Through Finland to St. Petersburg. By A. MacCullum Scott. London: Grant Richards, 1908. Size 7½ × 5, pp. x. and 292. *Map and Illustrations. Price 2s. 6d. net. Presented by the Publisher.*

Russia—Orel. **Jacobi.**

Zapiski Imp. Russ. G.S., Ethnography **32** (1907): pp. xii., 196, and l.

The Viatiches of the Orel Government. By P. I. Yakobi. *Maps.*

South-East Europe. **Windt.**

Through savage Europe: being the narrative of a journey (undertaken as special correspondent of the *Westminster Gazette*) throughout the Balkan States and European Russia. By Harry de Windt. London: T. Fisher Unwin, [1908]. Size 9 × 5½, pp. 300. *Illustrations. Price* 10*s.* 6*d. net. Presented by the Publisher.*

Sweden and Norway—Lapps. **Wiklund.**

De Svenska nomadlapparnas flyttningar till Norge i äldre och nyare tid. Af K. B. Wiklund. Upsala, 1908. Size 9 × 7½, pp. iv. and 248. *Presented by the Royal University, Upsala.*

On the migrations of the Lapps in ancient and modern times.

Switzerland—Davos. **Bach.**

Das Klima von Davos, nach dem Beobachtungsmaterial der eidgenössischen meterologischen Station in Davos. Von Dr. Hugo Bach. (*Neue Denkschriften der Schweizerischen Naturforschenden Gesellschaft*, Bd. xlii., Abh. 1.) Zürich, 1907. Size 11½ × 9½, pp. iv. and 106. *Diagrams. Presented by the Author.*

Switzerland—Grisons. **Schröter.**

Das St. Antönierthal im Prättigau in seinen wirtschaftlichen und pflanzengeographischen Verhältnisse, dargestellt von Dr. C. Schröter. (Separat-Abdruck aus dem Landwirtschaftlichen Jahrbuch der Schweiz, ix. Band, 1895.) Zürich: Institut O. Füssli, [1895; reprinted 1908]. Size 10 × 7, pp. 134–272. *Map and Illustrations. Price* 2*m.* 50. *Presented by the Publishers.*

An interesting regional study, treating in turn of the land, the people in their social and economic organization, and the vegetation features of the district.

Switzerland—Phytogeography. **Christ.**

La flore de la Suisse et ses origines. Par H. Christ. Nouvelle édition, augmentée d'un aperçu des récents travaux géobotaniques. Basle, etc.: Georg et Cie., 1907. Size 9½ × 6, pp. xvi., 572, and 120. *Maps and Illustrations. Price* 13*s.*

The flora is described from a distinctly geographical view point.

United Kingdom—Climatology. *Scottish G. Mag.* **24** (1908): 169–186. **Watt.**

The climate of the British Isles. By Andrew Watt. *Maps, Illustration, and Diagrams.*

United Kingdom—Cornwall. **Hudson.**

The Land's End: a naturalist's impressions in West Cornwall. By W. H. Hudson. London: Hutchinson & Co., 1908. Size 9 × 5½, pp. viii. and 324. *Illustrations. Price* 10*s.* 6*d. net. Presented by the Publishers.*

United Kingdom—Derbyshire, etc. **Gibson and others.**

Memoirs of the Geological Survey; England and Wales. Explanation of sheet 125. The geology of the southern part of the Derbyshire and Nottinghamshire Coalfield. By W. Gibson, T. I. Pocock, C. B. Webb, and R. L. Sherlock. London, 1908. Size 9½ × 6, pp. viii. and 200. *Sections.*

United Kingdom—Grampians. **Macnair.**

The geology and scenery of the Grampians and the valley of Strathmore. By Peter Macnair. 2 vols. Glasgow: J. MacLehose & Sons, 1908. Size 9 × 6, pp. (vol. 1) xiv. and 196; (vol. 2) xii. and 200. *Maps, Sections, and Illustrations. Price* 21*s. net. Presented by the Publishers.*

United Kingdom—London. **Baedeker.**

London and its environs. Handbook for travellers. By Karl Baedeker. Leipzig (London: Dulau & Co.), 1908. Size 6½ × 4, pp. xxxvi., 452, and 44. *Maps and Plans. Price* 6*s. Presented by the Editor.*

United Kingdom—Meteorology. *Symons's Meteorol. Mag.* **43** (1908): 65–74. **Mill.**

The Easter snowstorm of 1908. (By Dr. H. R. Mill and others.) *Maps.*

United Kingdom—Oxfordshire, etc. **Pocock.**

Memoirs of the Geological Survey: England and Wales. Explanation of special Oxford sheet. The geology of the country around Oxford. By T. I. Pocock. London, 1908. Size 9½ × 6, pp. vi. and 142. *Sections.*

United Kingdom—Rainfall. *Symons's Meteorol. Mag.* **43** (1908): 45–50. **Mill.**

The geographical distribution of rainfall in the British Isles. By Dr. H. R. Mill. *Sketch-map.*

Outline of the lectures lately delivered at the Society.

United Kingdom—Somerset, etc. **Ussher.**

Memoirs of the Geological Survey: England and Wales. Explanation of sheet 295. The geology of the Quantock Hills and of Taunton and Bridgwater. By W. A. E. Ussher. London, 1908. Size 9½ × 6, pp. iv. and 110. *Sketch-maps and Sections.*

Western Europe—Meteorology. *B.S. Languedoc. G.* **30** (1907): 333–348. **Sorre.**

Sur un rythme des pluies dans la Méditerranée occidentale. Par Maximilien Sorre. *Diagrams.*

Western Europe—Vosges. **Grucker.**

Die Vogesen. Von Eduard Grucker. (Geographische Monographien . . . herausgegeben von A. Scobel, 22.) Bielefeld, etc.: Velhagen & Klasing, 1908. Size 10 × 7, pp. 170. *Map and Illustrations. Price* 4*s.*

ASIA.

Asia. **Forrest.**

Selections from the travels and journals preserved in the Bombay Secretariat. Edited by George W. Forrest. Bombay, 1906. Size 12½ × 9½, pp. xxviii., 304, and xxx. *Maps. Presented by the Bombay Secretariat.*

Mr. Forrest here prints a number of hitherto unpublished papers relating to travel, in Central Asia and elsewhere, in the earlier part of the nineteenth century.

Central Asia. **Stein.**

Mountain panoramas from the Pamirs and Kwen Lun. Photographed and annotated by Dr. M. Aurel Stein. London: R.G.S., 1908. Size 13 × 8½, pp. x. and 36. *Map and Panoramas. Price* (*to Fellows*), 14*s. net*; (*to non-Fellows*), 20*s. net.*

China—Political. **Hertslet.**

Hertslet's China Treaties. Treaties, etc., between Great Britain and China, and between China and Foreign Powers; and Orders in Council, Rules, Regulations, Acts of Parliament, Decrees, etc., affecting British interests in China, in force on January 1, 1908. 3rd edit. Revised by Godfrey G. P. Hertslet, with the assistance of Edward Parkes. 2 vols. London: Wyman & Sons, 1908. Size 9½ × 6, pp. vi. and 1300. *Maps and Plan. Price* 35*s. Presented by the Foreign Office.*

This useful work has been carefully revised and brought up to date. The treaties are in three classes: (1) Treaties between Great Britain and China, 1842–1907; (2) between other Powers and China, 1869–1907. [The former date appears, both in the contents and text, as 1689.] (3) Treaties between European Powers with reference to China.

India. **Murdoch.**

From Edinburgh to India and Burmah. By W. G. Burn Murdoch. London: G. Routledge & Sons, [1908]. Size 9 × 6, pp. xiv. and 404. *Illustrations. Price* 10*s.* 6*d. net. Presented by the Publishers.*

India. ———

The Imperial Gazetteer of India. The Indian Empire. Vol. 2, Historical. New edition. Oxford: Clarendon Press, 1908. Size 9 × 5½, pp. xxxvi. and 574. *Map. Price* 6*s. net. Presented by the India Office.*

The separate chapters are mostly by experts in the several fields covered. Sir W. Hunter's sketch of the History of European settlement has been revised and brought up to date.

India. ———

The Imperial Gazetteer of India. New edition. Vols. 5–14. Abāzai to Karā. Oxford: Clarendon Press, 1908. Size 8½ × 5½. *Maps. Price* (*set of* 26 *vols.*) £5. *Presented by the India Office.*

India—Himalaya. **Burrard and Hayden.**

A sketch of the geography and geology of the Himalaya mountains and Tibet. By Colonel S. G. Burrard and H. H. Hayden. Parts 1–3. Calcutta, 1907. Size 12 × 9, pp. 1–230. *Maps, Profiles, and Illustrations. Presented by the India Office.* [To be reviewed.]

India—Historical. **Foster.**

The English factories in India, 1622–1623. A calendar of documents in the India Office and British Museum. By William Foster. Oxford: Clarendon Press, 1908. Size 9 × 6, pp. xl. and 390. *Plan. Price* 12*s.* 6*d. net. Presented by the India Office.*

This instalment reproduces all the letters of the years mentioned, preserved at the India Office or British Museum. As in former volumes, Mr. Foster (now Superintendent of Records at the India Office) supplies a lucid and readable introduction, gathering up the leading points in the story.

India—Nepal. **Lévi.**

Annales du Musée Guimet. Le Nepal: Étude historique d'un royaume hindou. Par Sylvain Lévi. Vol. 3. Paris: E. Leroux, 1908. Size 12 × 6½, pp. 224. *Illustrations. Price* 10*s.*

This, the concluding, volume deals with inscriptions.

India—North-West Frontier. ———

North-West Frontier Province Gazetteer: Bannu district. Two vols. Peshawar, 1907. Size 10 × 6½, pp. ("A" vol.) vi. and 140; ("B" vol.) c. *Maps. Presented by the India Office.*

Indo-China—Tonkin. **Diguet.**

Colonel E. Diguet. Les montagnards au Tonkin. Paris: A. Challamel, 1908. Size 10 × 6½, pp. xvi. and 160. *Illustrations. Price* 5*s.* 6*d.*

A French officer's account of certain mountain tribes, from personal observations.

Japan—Volcano Islands. **Wakimizu.**

Publ. Earthquake Investigation Com. No. 22 C. (1908): pp. 34.

The Ephemeral Volcanic Island in the Iwôjima Group. By T. Wakimizu. *Maps and Illustrations.*

This island was found in December, 1904. It was already worn nearly to sea-level when inspected by the writer.

Malay Archipelago. **Baren.**

Physiografische Problemen in den Indischen Archipel. Door J. van Baren. [Leyden], 1908. Size 9½ × 6½, pp. 12. *Presented by the Author.*

Malay Archipelago. **Verbeek.**

Rapport sur les Moluques: Reconnaissances géologiques dans la partie orientale de l'Archipel des Indes Orientales Néerlandaises. Par R. D. M. Verbeek. Batavia, 1908. Size 10 × 7, pp. xlvi. and 844. *Illustrations and Atlas* (size 20 × 14). *Presented by the Dutch Colonial Office.*

The concluding part of the author's report on his geological reconnaissance in 1899 among the islands between Celebes and New Guinea, including the Timor group.

Malay Archipelago—Krakatoa. **Ernst.**

Vierteljahrsschrift Naturfors. Ges. Zürich 52 (1907): 289-363.

Die neue Flora der Vulkaninsel Krakatau. Von A. Ernst. *Map and Illustrations.*

Malay Archipelago—Language. **Brandstetter.**

Malaio-polynesische Forschungen von Prof. Dr. Renward Brandstetter. Zweite Reihe. IV. Mata-Hari, oder, Wanderungen eines indonesischen Sprachforschers durch die drei Reiche der Natur. Lucerne, 1908. Size 9 × 6, pp. 56.

Studies in native nomenclature.

Persia. **Cresson.**

Persia: the awakening East. By W. P. Cresson. Philadelphia, etc.: J. B. Lippincott Co., 1908. Size 9 × 6, pp. 276. *Illustrations. Presented by the Author.*

Persia—Lake Urmia. *An. G.* 17 (1908): 128-144. **Mecquenem.**

Le lac d'Ourmiah. Par Roland de Mecquenem.

Philippines—Ethnology. *M. deuts. Ges. Ostasiens* 11 (1907): 1-31. **Scheerer.**

Zur Ethnologie der Inselkette zwischen Luzon und Formosa. Von Otto Scheerer. *Map and Illustrations.*

Russia—Siberia—Rivers. **Shostakovich.**

B.A. Imp. Sc., St. Petersburg (1908): 497-510, 553-570.

Débacle et congélation des eaux dans la Russie d'Asie. Par V. B. Šostakovič. *Map.* [In Russian.]

Russia—Siberia—Yeneseisk. *La G., B.S.G. Paris* **17** (1908): 117–124. **Backlund.**

Travaux et résultats de l'expédition de la Khatanga (1905). Par Helge Backlund. *Map.*

See note in the May number, p. 564.

Russian Central Asia. **Ficker.**

Zur Meteorologie von West Turkestan. Von Heinz v. Ficker. (From the 'Denkschriften der Math.-Naturwiss. Klasse K. A. Wissenschaften, Wien,' Band lxxxi. Wien, 1908.) Size 12½ × 9¼, pp. 36. *Map.*

Noticed in the June number, p. 647.

Turkey—Palestine. **Smith.**

Jerusalem: the topography, economics, and history from the earliest times to A.D. 70. By George Adam Smith. Two vols. London: Hodder & Stoughton, 1907-1908. Size 9 × 6, pp. (vol. 1) xx. and 498; (vol. 2) xvi. and 632. *Maps, Plans, and Illustrations. Price 24s. net.*

The high reputation of the author leaves little room for doubt that this will take its place as the standard work on the subject.

Turkey—Railways. *B.S.R. Belge G.* **32** (1908): 5–35. **Cambier.**

Le réseau ferré de la Turquie d'Asie. Par E. Cambier. *Sketch-map.*

A useful *résumé* of the subject of railway construction in Asiatic Turkey.

AFRICA.

Abyssinia—Language. **Armbruster.**

Initia Amharica: an introduction to spoken Amharic. By C. H. Armbruster. Part I. Grammar. Cambridge: University Press, 1908. Size 10 × 6, pp. xxiv. and 398. *Price 12s. net. Presented by the Publishers.*

A work of solid value to students of Amharic, bearing evidence that great care has been bestowed on its preparation. The material has been collected throughout from the mouths of natives.

British East Africa. **Patterson.**

The man-eaters of Tsavo, and other East African adventures. By Lieut.-Colonel J. H. Patterson. London: Macmillan & Co., 1907. Size 8½ × 5½, pp. xx. and 338. *Map and Illustrations. Price 7s. 6d. net.*

Central Africa. **Johnson.**

Tramps round the Mountains of the Moon and through the back gate of the Congo State. By T. Broadwood Johnson. London: T. Fisher Unwin, 1908. Size 8 × 5½, pp. xxiv. and 316. *Illustrations. Price 6s. Presented by the Publisher.*

Congo State. **Goffart.**

Le Congo: géographie, physique, politique, et économique. Par Ferdinand Goffart. 2e édit., revue . . . par George Morissens. Brussels: Misch & Thron, 1908. Size 8½ × 5½, pp. viii. and 502. *Maps. Price 7 fr. 50. Presented by the Publishers.*

German East Africa—Ethnology. **Nigmann.**

Die Wahehe: ihre Geschichte, Kult-, Rechts-, Kriegs- und Jagd- Gebräuche. Von E. Nigmann. Berlin: E. S. Mittler u. Sohn, 1908. Size 10 × 6½, pp. xii. and 132. *Maps and Illustrations. Price 3s. 6d.*

Kamerun. **Dominik.**

Vom Atlantik zum Tschadsee: Kriegs- und Forschungsfahrten in Kamerun. Von Hans Dominik. Berlin: E. S. Mittler u. Sohn, 1908. Size 10 × 6½, pp. viii. and 308. *Map and Illustrations. Price 5s. 5d.*

Nigeria, Southern—Ethnology. **Parkinson.**

J.R. Anthropological I. **37** (1907): 261–267.

A note on the Efik and Ekoi tribes of the eastern province of Southern Nigeria. By John Parkinson. *Illustrations.*

Nile Basin. *Cairo Sci. J.* **2** (1908): 79–94. **Lyons.**

Some unsolved problems of the Nile Basin. By Captain H. G. Lyons. *Diagram.*

Sahara. **Arnaud and Cortier.**

Mission Arnaud-Cortier. Nos confins Sahariens: étude de géographie militaire.

Par le Capitaine Edouard Arnaud et le Lieut. Maurice Cortier. Paris: E. Larose, 1908. Size 10 × 6½, pp. 512. *Maps and Illustrations. Price* 9*s.* 6*d.*

The larger part of the book treats of the military requirements of the French Sahara, from a geographical point of view. The remainder gives a report on the Arnaud-Cortier Mission across the desert (*Journal*, vol. **30**, p. 561).

Sahara. **Gautier.**

Missions au Sahara. Par E.-F. Gautier et R. Chudeau. Tome I.—Sahara Algérien. Par E.-F. Gautier. Paris: A. Colin, 1908. Size 9½ × 6½, pp. xv., 372. *Maps and Illustrations. Price* 15 *fr. Presented by the Publisher.* [To be reviewed.]

Sahara—Adrar. *La G., B.S.G.* **17** (1908): 265–280. **Cortier.**

L'Adrar des Ifor'ass. Par le lieut. [M. A.] Cortier. *Map.*

Sahara—Geology. *La G., B.S.G.* **17** (1908): 307–309. **Chautard and Lemoine.**

Sur la constitution géologique de quelques points de la Mauritanie d'après les échantillons rapportés par le capitaine Gerard. Par Jean Chautard et Paul Lemoine. *Sketch-map and Section.*

Sahara—Geology. *La G., B.S.G. Paris* **17** (1908): 111–114. **Freydenberg.**

Description géologique de l'itinéraire N'Guigmi-Bilma, d'après les échantillons rapportés par le lieutenant Ayasse. Par le capt. H. Freydenberg. *Map.*

See note in the July number, p. 85.

Sahara—Tawarek. *Tour du monde* **14** (1908): 109–156. **Aymard.**

Les Touareg du sud. Par le capt. Am. Aymard. *Sketch-map and Illustrations.*

South Africa. **Schultze**

Aus Namaland und Kalahari. Bericht an die Kgl. Preuss. Akademie der Wissenschaften zu Berlin über eine Forschungsreise im westlichen und zentralen Südafrika, ausgeführt in den Jahren 1903–1905. Von Dr. Leonhard Schultze. Jena: G. Fischer, 1907. Size 11 × 8, pp. xiv. and 752. *Map and Illustrations. Presented by the Publishers.*

See Review in the June number, p. 663.

South Africa—Geodesy. **Morris and others.**

Geodetic Survey of South Africa. Vol. 5. Reports on the Geodetic Survey of the Transvaal and Orange River Colony, executed by Colonel Sir W. G. Morris; and of its connection, by Captain H. W. Gordon, with the Geodetic Survey of Southern Rhodesia. With a preface and introduction by Sir David Gill. London: Harrison & Sons, 1908. Size 13 × 8½, pp. xxxviii. and 464. *Maps, Illustrations, and Diagrams. Presented by the Agent-General for the Transvaal.*

South Africa—Orography. *Sitzungsber. K. Preuss. A.W.* (1908): 230–258. **Penck.**

Der Drakensberg und der Quathlambabruch. Von Albrecht Penck. *Sections.*

South Africa—Trade.

First annual statement of the trade and shipping of the colonies and territories forming the South African Customs Union, 1906. Cape Town, 1907. Size 13½ × 8½.

South Africa—Zambezi. *Scottish G. Mag.* **24** (1908): 193–200. **Trevor-Battye.**

Above the Victoria Falls. By Aubyn Trevor-Battye.

Sudan. **Freydenberg.**

Etude sur le Tchad et le bassin du Chari. Par H. Freydenberg. Paris: F. Schmidt, 1908. Size 10 × 6½, pp. vii. and 192. *Sketch-maps and Illustrations. Presented by the Publisher.*

A careful study of the physical conditions of the Lake Chad area.

Transvaal—Census.

Results of a census of the Transvaal Colony and Swaziland, taken on the night of Sunday, April 17, 1904 (pp. lxxxvi. and 756). Supplementary tables in respect of the population of the districts and wards defined by Proclamation No. 42 (Administration), 1904 (pp. viii. and 370). London and Pretoria, 1906. Size 15½ × 13. *Maps, Plans, and Diagrams.*

Tripoli. *G.Z.* **14** (1908): 129–137. **Banse.**

Die tripoliner Landschaft. Von Ewald Banse. *Illustrations.*

Tripoli. **Martino**

Giacomo de Martino. Cirene e Cartagine: note e impressioni della carovana de Martino-Baldari; Giugno-Luglio, 1907. Bologna: N. Zanichelli, 1908. Size 10 × 7, pp. xvi. and 198. *Map and Illustrations. Price* 6*s.*

West Africa—Boundary. *Globus* **93** (1908): 229–234. **Reitzenstein.**

Längs der Ostgrenze von Kamerun. Von Leutnant Freiherr von Reitzenstein. *Illustrations.*

The author took part in the Franco-German Boundary Commission.

West Africa—Boundary. *Deutsches Kolonialblatt* **19** (1908): 424–428. ———

Das deutsch-französische Grenzabkommen, betreffend Kamerun und den Congo français, vom 18. April 1908. *Map.*

See note and map in the July number, pp. 87–88.

West Africa—Coast. *An. G.* **17** (1908): 97–104. **Hubert.**

La "barre" au Dahomey. Par Henry Hubert. *Diagram and Illustrations.*

See note in the August number, p. 185.

West-Central Africa. **Johnston.**

George Grenfell and the Congo. A history and description of the Congo Independent State and adjoining districts of Congoland, together with some account of the native peoples and their languages, the fauna and flora; and similar notes on the Cameroons and the island of Fernando Pó, the whole founded on the diaries and researches of the late Rev. George Grenfell; on the records of the Baptist Missionary Society; and on additional information contributed by the author, by the Rev. Lawson Forfeitt, Mr. Emil Torday, and others. By Sir Harry Johnston. Two vols. London: Hutchinson & Co., 1908. Size 9½ × 6½, pp. xxiv., xx., and 990. *Maps and Illustrations. Price* 30*s. net. Presented by the Author.* [To be reviewed.]

NORTH AMERICA.

Bermudas—Bibliography. **Cole.**

Bermuda in periodical literature, with occasional references to other works. A bibliography, by George Watson Cole. (Brookline, Mass.: privately printed), 1907. Size 9¼ × 6, pp. xii. and 276. *Portrait and Facsimile titles. Presented by the Author.*

This seems to give a very complete list of the scientific papers which have appeared on the subject of Bermuda, while it includes also papers of a more popular character. It is not quite easy to recognize the system which has governed the inclusion of entries from non-periodical literature.

British North America—Labrador. **Wallace.**

The long Labrador trail. By Dillon Wallace. London: Hodder & Stoughton, (1907). Size 8½ × 5½, pp. xii. and 316. *Maps and illustrations. Price* 7*s.* 6*d.*

Mexico—Historical. **MacNutt.**

Letters of Cortes: the five letters of relation from Fernando Cortes to the Emperor Charles V. Translated and edited . . . by Francis Augustus MacNutt. 2 vols. New York and London: G. P. Putnam's Sons, 1908. Size 9½ × 6, pp. (vol. 1) xii. and 354; (vol. 2) vi. and 374. *Portraits and facsimile Maps and Plans. Price* 42*s. net. Presented by the Publishers.*

Mexico—Geological History. **Hill.**

Growth and decay of the Mexican plateau. By Robert T. Hill. (From the *Engineering and Mining Journal*, vol. **85**, 1908.) Size 12 × 9, pp. 8. *Map and Illustrations.*

Another paper by Mr. Hill on the Mexican plateau was referred to in vol. **30**, p. 93.

Mexico—Sierra Madre. *Z. Ges. E. Berlin* (1908): 147–167. **Preuss.**

Reise zu den Stämmen der westlichen Sierra Madre in Mexiko. Von Dr. K. Th. Preuss. *Illustrations.*

United States. ———

Report of the Superintendent of the Coast and Geodetic Survey, showing the

progress of the work from July 1, 1906, to June 30, 1907. Washington, 1907. Size 11¼ × 9, pp. 566. *Maps, Illustrations, and Diagrams.*

One of the appendices treats of earth-movements in the California earthquake of 1906.

United States—California. **Barrett and Kroeber.**

The ethnogeography of the Pomo and neighbouring Indians. By S. A. Barrett. The geography and dialects of the Miwok Indians. By the same. On the evidences of the occupation of certain regions by the Miwok Indians. By A. L. Kroeber. (*University of California Publications in American Archeology and Ethnology*, vol. 6, Nos. 1–3.) Berkeley, Cal., 1908. Size 11 × 7, pp. 1–380. *Maps. Presented by the University of California.*

United States—California. *Sierra Club B.* 6 (1908): 211–220. **Muir.**

The Hetch-Hetchy Valley. By John Muir. *Illustrations.*

In describing this part of the Yosemite park, the writer protests against the scheme for damming the valley for water-supply purposes.

United States—Commerce. *B. American G.S.* 40 (1908): 129–143. **Johnson.**

Geographic influences affecting the early development of American commerce. By Emory R. Johnson.

United States—Ice Age. *American J. Sc.* 25 (1908): 217–226. **Carney.**

A possible overflow channel of ponded waters antedating the recession of Wisconsin ice. By Frank Carney. *Map and Illustration.*

United States—New Jersey. *Pr. A. Nat. Sc., Philadelphia* 59 (1907): 452–459. **Stone.**

The life-areas of southern New Jersey. By Witmer Stone.

United States—New Jersey. *J.G.* 6 (1908): 177–182. **Whitbeck.**

Geographical influences in the development of New Jersey. By R. H. Whitbeck.

See note in the June number, p. 678.

United States—Ohio. *American J. Sc.* 25 (1908): 239–243. **Hubbard.**

Ancient finger lakes in Ohio. By Geo. D. Hubbard. *Sketch-maps.*

United States—Sierra Nevada. *Sierra Club B.* 6 (1908): 225–234. **Gilbert.**

Lake Ramparts. By G. K. Gilbert. *Illustrations.*

Discusses the origin of the lines of boulders fringing the shores of many Sierra lakes (see August number, p. 190).

United States—Swamps. *National G. Mag.* 19 (1908): 190–199. **Chapman.**

A drowned empire. By Robert T. Chapman. *Illustrations.*

Describes various swamp lands of the United States in connection with a movement lately set on foot for their reclamation.

United States—Washington. ———

A review of the resources and industries of Washington, 1907. Published . . . by the Bureau of Statistics, etc. Olympia, Washington, 1907. Size 9 × 5½, pp. 238 and 56. *Map and Illustrations.*

United States—Waterways. *Popular Sc. Monthly* 72 (1908): 289–303. **McGee.**

Our inland waterways. By Dr. W J McGee.

Discusses the recent movement for the improvement of internal navigation. (See July number, p. 89.)

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Geophysics. *P. American Philos. S.* 46 (1907): 369–416. **See.**

The new theory of earthquakes and mountain formation, as illustrated by processes now at work in the depths of the sea. By T. J. J. See. Size 9¼ × 6¼. *Maps and Diagrams. Also separate copy, presented by the Author.*

Glacial Deposits. *Z. Ges. E. Berlin* 1908: 187–191. **Werth.**

Zur Unterscheidung und Benennung eiszeitlicher Ablagerungen. Von Dr. Emil Werth.

Glaciers—Structure. *Z. Gletscherkunde* 2 (1908): 198–212. **Crammer.**

Zur Entstehung der Blätterstruktur der Gletscher aus der Firnschichtung. Von Hans Crammer. *Illustrations.*

Limnology. *Popular Sc. Monthly* **72** (1908): 337–351. **Birge.**

The respiration of an inland lake. By Prof. E. A. Birge. *Diagram.*

Under the term "respiration" the author includes the exchange of gases between the air and the water, and that between the water and the included organisms. (See Monthly Record, August, p. 190.)

Limnology.

Instructions for the study of lakes. Compiled by the members of the Permanent Commission for the study of the Russian lakes. St. Petersburg, 1908. Size 10 × 6½, pp. 298. *Illustrations.* [In Russian.] *Presented by the Imperial Russian Geographical Society.*

Meteorology—Evaporation. **Bigelow.**

U.S. Monthly Weather Rev. **35** (1907): 311–316; **36** (1908): 24–39.

Studies on the phenomena of the evaporation of water over lakes and reservoirs. By Prof. Frank H. Bigelow. Parts I.–III. *Illustrations and Diagrams.*

Meteorology—Pressure. *Meteorol. Z.* **25** (1908): 103–108. **Trabert.**

Die Luftdruckverhältnisse in der Niederung und ihr Zusammenhang mit der Verteilung der Temperatur. Von W. Trabert.

Natural Regions. *G.Z.* **14** (1908): 1–13, 94–110, 137–150. **Hettner.**

Die geographische Einteilung der Erdoberfläche. Von Alfred Hettner.

Oceanography—Deposits. **Van't Hoff and others.**

Sitzb. K. Preuss. A.W. 1897–1908, *passim.*

Untersuchungen über die Bildung der ozeanischen Salzablagerungen, I.–LII. Von J. H. van't Hoff u.a. *Diagrams.*

Oceanography—Troughs. *Globus* **93** (1908): 60–63. **Arldt.**

Die geographische Lage der abyssischen Gräben. Von Dr. Th. Arldt.

Sea-level. *M. k.k. G. Ges. Wien* **51** (1908): 1–56. **Gnirs.**

Beobachtungen über den Fortschritt einer säkularen Niveauschwankung des Meeres während der letzten zwei Jahrtausende. Von Dr. Anton Gnirs.

See note in the Monthly Record, July, p. 91.

Seismology. **Costanzi.**

Contributo alla interpretazione elastica dei fenomeni sismici e bradisismici. Del Tenente Giulio Costanzi. Pavia, 1908. Size 9¼ × 6½, pp. 92. *Diagrams. Presented by the Author.*

Seismology. *P.R.S. Edinburgh* **38** (1908): 217–230. **Knott**

Seismic radiations. By Prof. C. G. Knott.

Seismology. *Nature* **77** (1908): 592–597. **Milne.**

Recent Earthquakes. By Prof. J. Milne. *Sketch-maps.*

Snow-forms. *Z. Gletscherkunde* **2** (1908): 296–303. **Spethmann and Brückner.**

Schneeschmelzkegel auf Island. Von Hans Spethmann. *Diagram and Illustr.*

Schneeschmelzkegel in den Alpen und Nieve Penitente. Von Ed. Brückner. *Illustration.*

See note, *ante*, p. 312.

Terrestrial Magnetism. *Meteorol. Z.* **25** (1908): 97–103. **Nippoldt**

Bemerkungen zu neuen Karten des Feldes der täglichen Variation des Erdmagnetismus. Von A. Nippoldt. *Maps.*

Tides. **Harris.**

Manual of tides. Part V. Currents, shallow-water tides, meteorological tides, and miscellaneous matters. By Rollin A. Harris. (Reprint of Appendix 6 to the Report of the U.S. Coast and Geodetic Survey for 1907.) Washington, 1908. Size 11½ × 9, pp. 231–546. *Maps and Diagrams.*

Tides. **Ruthven.**

Theory of the tides. By J. F. Ruthven. Adelaide, 1907. Size 10 × 6, pp. 12. *Diagrams.*

Zoogeography—Fishes. **Reichard.**

Die deutschen Versuche mit gezeichneten Schollen. II. Bericht. Von Adolf C. Reichard. Oldenburg i. Gr., 1908. Size 13 × 10½, pp. 58. *Maps.*

On experiments with a view to throwing light on the migrations, etc., of the plaice.

NEW MAPS.

By E. A. REEVES, *Map Curator*, R.G.S.

EUROPE.

Austria. **Peucker.**

Generalkarte von Bosnien und der Hercegowina nebst Dalmatien. Bearbeitet von Dr. Karl Peucker. Scale 1 : 864,000 or 1 inch to 13·6 stat. miles. Vienna: Artaria & Co., 1908. *Price* 3 *kr.* *Presented by the Publisher.*

British Islands—Channel Islands. **Bartholomew and Piquet.**

New survey map of Jersey after the map of R. C. Carrington, F.R.A.S., and latest authorities by J. C. Bartholomew, F.R.G.S., and edited by George A. Piquet. Scale 1 : 21,700 or 2·9 inches to 1 stat. mile. St. Heliers: C. P. Du Parcq, [1908].

A boldly drawn coloured map of the island. Round the coast-line the low-water mark and two and three fathom lines are shown. Numerous heights of land are shown in figures, a special feature being the indication of the heights of rocks off the coast above low water.

British Islands—England and Wales. **Ordnance Survey.**

Sheets published by the Director-General of the Ordnance Survey, Southampton, from July 1 to 31, 1908.

1-inch (third edition):—

In outline, 112, 116, 127, 201, 311. 1*s. each* (engraved).

With hills in brown or black, 99, 347. 1*s. each* (engraved).

Large-sheet series, printed in colours, folded in cover or flat in sheets, 51, 61, 62, 84. *Price, on paper,* 1*s.* 6*d.*; *mounted on linen,* 2*s.*; *mounted in sections,* 2*s.* 6*d. each.*

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British Islands—England and Wales. **Geological Survey.**

1-inch Map—New Series, printed in colours. Drift edition, sheet 54: Scarborough, Filey, Hunmanby, etc. *Price* 1*s.* 6*d.*

6-inch maps—Uncoloured.

Brecknockshire, 46, S.W., 47 N.W., N.E., 51 N.W. **Glamorgan,** 6 S.W., S.E., 12 N.W., N.E., S.W., S.E., 13 N.W., S.W., 19 N.W., N.E., S.W., S.E., 28 N.W., N.E., S.W., S.E., 29 S.E.,

42 N.W. **Monmouthshire**, 10 S.E., 11 N.W., N.E., S.W., S.E., 16 N.E., 17 N.W., N.E., S.W., S.E., 18 S.W., 27 S.E., 28 S.W. 1*s.* 6*d. each.*

(*E. Stanford, London Agent.*)

Europe. **Bjørnbo and Petersen.**

Anecdota Cartographica Septentrionalia. Ediderunt Axel Authon Bjørnbo et Carl S. Petersen. Hauniæ: Sumptibus Societatis Regiæ Scientiarum Danicæ, 1908. *Presented by the Royal Danish Society of Sciences.*

This portfolio contains photographic facsimiles of eleven maps of northern Europe drawn between the fourteenth and seventeenth centuries, accompanied by explanatory text and lists of names. No attempt has been made to give a systematic cartographical survey of the region included, but, according to the editor's introduction, the work must be considered purely as a collection of material—a chronologically arranged series of cartographical sources for the period covered.

The process of reproduction has received serious attention, and every effort has been made to secure a clear and truthful copy of the original, with as little touching up as possible. In places where there was no doubt as to the original, but where the photograph, on account of impurities in the material, shades of colour, etc., failed to secure the purpose, the proofs were cautiously corrected in accordance with the original, and occasionally, in order to obtain greater distinctness, a tint of colour has been added to the water or the land. Due acknowledgment is made to M. Dahlgren of Stockholm, Prof. Palmén of Helsingfors, Hofrat v. Wieser of Innsbruck, Dr. W. Ruge of Leipzig, Prof. Uzielli of Florence, and others for advice and assistance given. The editors and the Royal Danish Society of Sciences have rendered valuable service to all interested in the early cartography of Europe by the publication of these interesting facsimiles. The following is a list of the maps included, with the libraries where the originals are deposited:—1, Anonymous Catalanian Sea-Chart, fourteenth century [section]. (Biblioteca Nazionale, Museo Borbonico, Napoli). 2, Henricus Martellus Germanus: Map of the North, ca. 1490 (Universiteitsbibliotheek, Leiden). 3, Henricus Martellus Germanus: Map of Scandinavia, ca. 1490 (British Museum, London). 4, Anonymous Chart of the Atlantic Ocean, ca. 1504 [section] (Kgl. Bayerische Armee-Bibliothek, München). 5, Cornelis Anthonisz.: Map of Denmark and Adjacent Countries, ca. 1550–1565 (Ehemal. Universitätsbibliotheek, Helmstedt). 6, Marcus Jorden: Map of Schleswig and Holstein, 1559 (Universiteitsbibliotheek, Leiden). 7, Anonymous Map of the Inner Baltic, 1550–1600 (Universiteitsbibliotheek, Leiden). 8, Anonymous Map of North Fjord, 1594 (K. K. Hofbibliothek, Wien). 9, Anonymous sketch of a map of the Southern part of the West Coast of Norway, 1586–1600 (K. K. Hofbibliothek, Wien). 10, Simon van Salinghen: Map of the Northernmost Parts of Europe, 1601 (Riksarkivet, Stockholm). 11, Joris Carolus: Map of Iceland, Greenland, and the Northern Part of America, 1626 (Algemeene Rijksarchief, 's Gravenhage).

France. **Ministre de l'Intérieur, Paris.**

Carte de la France dressée par ordre du Ministre de l'Intérieur. Scale 1: 100,000 or 1 inch to 1·6 stat. mile. Sheets: IV.–17, Quimper; V.–16, Gourin; IX.–10, Cherbourg; XIV.–21, Châtillon-sur-Indre; XV.–13, Mantes; XVI.–21, Issoudun; XVIII.–9, St. Quentin; XIX.–31, Florac; XX.–30, Largentière; XXV.–33, Castellane; XXVI.–34, Nice; XXX.–40, Bocognano; XXX.–41, Zicavo. Paris: Ministère de l'Intérieur, Service Vicinal, 1908. *Price* 0.80 *fr. each sheet.*

These are new editions.

ASIA.

China. **K. Preus. Landesaufnahme.**

Karte von Tschili und Schantung. Bearbeitet in der kartogr. Abteilung der Kgl. Preuss. Landesaufnahme. Scale 1:200,000 or 1 inch to 3·2 stat. miles. Sheets: C 11, Tang hsiën; C 12 Dscheng ding fu; D 9, Hsüan 'hua fu; D 11, Báu ding fu; D 12, Schen dschóu; D 13, Dsi dschóu; E 9, Tschang ping dschóu; E 10, Peking; E 11, Yung tsing hsien; E 12, Ho dsiën fu; E 13, De dschóu; F 9, Daun 'hua dschóu; F 10, Báu di hsien; F 11 Tiëntsin; F 12, Yen schan hsiën; F 13, Wu ding fu; G 9, Dsiën tschang ying; G 10, Yung ping fu; G 11, Li ba áu; G 13, Li dsing hsien; H 9, Schan 'hai guan; H 10, Tsin wang dáu. Berlin: K, Preuss. Landesaufnahme, 1907. *Price* 2m. *each sheet.*

Twenty-two sheets of the new large-scale map of the provinces of Chih-li and Shantung, now in course of publication by the German Government, and based upon

the most reliable surveys and sketches up to date. It is printed in colours, and in the case of important places, the names are repeated in Chinese characters. The present sheets include Peking and the surrounding country, extending as far south as the northern frontier of Shantung.

Philippine Islands. **Hodgson.**

Map of the Philippine Islands, compiled from original sources by Caspar W. Hodgson. Scale 1 : 1,115,000 or 1 inch to 17·6 stat. miles. New York: World Book Company, 1908.

From the list of authorities consulted in the preparation of this map, it would appear that no pains have been spared to render it as complete and up to date as possible. It is a good general map, clearly printed in colours, and measures 4½ feet by 3½ feet.

AFRICA.

Africa. **Passage.**

Gliederung Afrikas nach physikalischen und wirtschaftlichen Gesichtspunkten. Von Siegfried Passage. Scale 1 : 60,000,000 or 1 inch to 947 stat. miles. *Petermanns Mitteilungen*, Jahrgang, 1908, Tafel 13. Gotha: Justus Perthes, 1908. *Presented by the Publisher.*

Algeria. **Jonnart.**

Carte de l'Algérie. Dressée par ordre de M. Jonnart, Gouverneur Général de l'Algérie, au Service des Cartes et Plans du Gouvernement Général de l'Algerie. Scale 1 : 200,000 or 1 inch to 3·2 stat. miles. Sheets: 4, Alger; 5, Djurjura. Algiers: Service des Cartes et Plans du Gouvernement Général de l'Algérie. [1908.] *Price* 1 *fr. each sheet. Presented by M. R. de Flotte Roquevaire, Chef du Service des Cartes et Plans du Gouvernement Général de l'Algérie.*

Two sheets of a good general map of Algeria, printed in colours. They include Alger and the county to the east for about 100 miles. Railways and roads up to date are clearly shown.

Egypt. **Survey Department, Cairo.**

Topographical map of Egypt. Scale 1 : 50,000 or 1·6 inch to 1 stat. mile. Sheets: S.W. III.–I., Senures; III.–II., Birket Qarun; IV.–I., Medinet el Fayum; IV.–II., El Nazla; V.–I., Ahnasia; V.–II., El Gharag el Sultani. Cairo: Survey Department, 1908. *Presented by the Director-General, Survey Department, Cairo.*

Gold Coast. **Guggisberg.**

Map of the Gold Coast. Published by the authority of Sir John Pickersgill Rodger, K.C.M.G., Governor, under the direction of Major F. G. Guggisberg, R.E., F.R.G.S., Director of Surveys, Gold Coast. Scale 1 : 125,000 or 1 inch to 1·9 stat. mile. Sheets: 72-J–IV., Wiawoso; 72-K–III., Obuasi (2nd edit.); 72-P–III. and 72-V–I., Tanoso and Beyin; 72-P–IV., Prestia; 73-G–IV., Dsoje. Edinburgh and London: W. & A. K. Johnston, Ltd., 1908. *Price 2s. each sheet. Presented by Major F. G. Guggisberg, R.E., Director of Surveys, Gold Coast.*

AMERICA.

Brazil. **Freire.**

Republica dos Estados Unidos do Brazil. Mappa organisado e desenhado por Olavo Freire. Scale 1 : 4,000,000 or 1 inch to 63·1 stat. miles. Rio de Janeiro: Francisco Alves & Cia., [1908].

A somewhat sketchy and decidedly overcoloured map of Brazil, useful specially for the enlarged inset plans it contains. These are of Recife, S. Paulo, S. Salvador, Bello Horizonte, Belem, and of the commercial centre of Rio de Janeiro.

Canada. **Department of the Interior, Ottawa.**

Standard Topographical Map of Canada. Scale 1 : 500,000 or 1 inch to 7·8 stat. miles. Sheet 29, Lake Nipigon. Ottawa: Department of the Interior, 1907. *Presented by the Department of the Interior, Ottawa.*

Canada—British Columbia. **Boyd.**

Special map of Rossland, British Columbia. By W. H. Boyd. Scale 1 : 4800 or 13·2 inches to 1 stat. mile. Ottawa: Department of Mines, Geological Survey Branch, 1908. *Presented by the Geological Survey of Canada.*

GENERAL.

World. **Johnston.**

Johnston's Royal Atlas of Modern Geography, exhibiting, in a series of sixty entirely original and authentic maps, the present condition of geographical discovery and research in the several Countries, Empires, and States of the World. Edinburgh and London: W. & A. K. Johnston, Ltd., 1908. *Price* £4 4*s. net. Presented by the Publishers.*

In this new edition of the Royal Atlas three entirely new maps have been added, viz. the South Polar Regions, a political map of the British Isles, and a map of Japan. The map of the Mediterranean has been extended to the west so as to include the whole of the Atlantic coast of Spain and Portugal. These additions make the atlas more complete, and the execution of the new maps is very creditable, with the exception of the colouring, which in the case of the polar maps is somewhat heavy and overdone. Generally speaking, the work of revision has been carefully attended to, so far as is possible without entirely redrawing the maps, which in some cases is now almost necessary in order to render the physical features satisfactory. At the end of the atlas a useful "General Index to the Principal Places of the World" is given for the first time, consisting of an alphabetical list of places with their latitudes and longitudes.

World. **St. Martin and Schrader.**

Atlas Universel de Geographie, construit d'après les sources originales et les documents les plus récents, cartes, voyages, mémoires, travaux géodesiques, etc., avec un texte analytique. Ouvrage commencé par M. Vivien de Saint Martin et continué par Fr. Schrader. Sheet No. 76. Etats-Unis d'Amerique (Sud-Est). Paris: Hachette et Cie., 1908. *Presented by the Publisher.*

In the compilation of this sheet, the recent United States government survey appear to have been utilized, including those of the Geological Survey, and the Coast and Geodetic Survey. Thirteen sheets out of a total of ninety now remain to be published in order to complete the atlas.

World. **Schrader and Gallouédec.**

Atlas Clásicode Geografia Moderna. Por F. Schrader y L. Gallouédec. Trazado especialmente para los Institutos y Colegios de los Estados de la America Latina. Paris: Hachette et Cie., [1908]. *Price* 7.50 *fr.*

A useful little atlas specially prepared for the educational establishments of South American countries. In general appearance the maps resemble those in Schrader's 'Atlas de Géographie Moderne,' and consist of a well-selected series of coloured physical and political maps of all parts of the world, special attention being given to South America. There are many insets on small scales, and by means of numerous diagrams, sections, and text surrounding the maps, much useful information is given.

CHARTS.

Admiralty Charts. **Hydrographic Department, Admiralty.**

Charts and Plans published by the Hydrographic Department, Admiralty, during June, 1908. *Presented by the Hydrographer, Admiralty.*

New Charts.

No.	Inches.	
3668 m	= 1·0	Gulf of Bothnia:—Approaches to Marichamn, Degerö, and Bomarsund. 4*s.*
3688 m	= 0·9	Ports on the west coast of Florida:—Approaches to Port Inglis, Charlotte harbour. 3*s.*
819 m	= {2·9 / 7·9}	Ceylon:—Approaches to Galle harbour, Galle harbour. 3*s.*
1236 m	= 3·3	China, north coast:—Approaches to Ryojun ko (*Port Arthur*). 2*s.*

New Plans and Plans added.

801 m	= 4·7	San Domingo, approaches to Port au Prince. New Plan:—Jeremie bay. 3*s.*
2395 m	= 1·0	Ports in the Philippine islands. New Plan:—Port Palapag and Laoang (*Laguan*) bay. 2*s.*

Charts Cancelled.

No.			
819	Ceylon:—Approaches to Point de Galle harbour, including the Gindura and Bellows rocks.	New chart. Approaches to Galle harbour: Galle harbour	819
820	Ceylon:—Point de Galle harbour.		
1236	China north coast:—Approaches to Port Arthur or Lu shun kau.	New chart. Approaches to Ryojun ko (*Port Arthur*)	1236

Charts that have received Important Corrections.

No. 2554, Italy, Leghorn roadstead:—Port of Leghorn. 1749, South America, east coast:—Monte Video to Buenos Aires. 2544, South America, east coast—Rio de la Plata. 22, Persian gulf:—Kuweit harbour and approaches. 1419, Andaman islands:—Long island to Port Blair. 1459, China, south coast:—Hong Kong harbour. 3280, China, south coast:—Hong Kong waters, east. 3279, China, south coast:—Hong Kong waters, west. 873, Japan:—Amami group. 457, Japan:—Aburatani harbour and approaches. 2185. New Zealand:—Nelson Anchorages. 2658, Solomon Islands:—Gavutu and Tulagi harbours.

Indian Ocean and Red Sea. **Meteorological Office.**

Monthly meteorological charts of the Indian Ocean north of 15° S. lat. and Red Sea, August, 1908. London: Meteorological Office, 1908. *Price 6d. each. Presented by the Meteorological Office.*

North Atlantic and Mediterranean. **Meteorological Office.**

Monthly meteorological charts of the North Atlantic and Mediterranean, August, 1908. London: Meteorological Office, 1908. *Price 6d. each. Presented by the Meteorological Office.*

North Atlantic. **U.S. Hydrographic Office.**

Pilot chart of the North Atlantic Ocean, July, 1908. Washington: U.S. Hydrographic Office, 1908. *Presented by the U.S. Hydrographic Office.*

North Pacific. **U.S. Hydrographic Office.**

Pilot chart of the North Pacific Ocean, August, 1908. Washington: U.S. Hydrographic Office, 1908. *Presented by the U.S. Hydrographic Office.*

PHOTOGRAPHS.

China. **Davies and Hilton-Johnson.**

One hundred and twenty-six photographs of the Chih-li Province, China, taken by Major H. R. Davies, 52nd Oxfordshire Light Infantry, and Captain A. H. Hilton-Johnson, Lincolnshire Regiment, 1907. *Presented by Major H. R. Davies.*

An interesting and characteristic set of photographs mounted in an album, made specially valuable by the care Major Davies has taken to classify and describe them. Amongst them are some good panoramic views of scenery.

(1, 2, and 4–6) Typical scenery on the road between Peking and Shan-hai-kuan; (3) The Lan Ho near Yung-p'ing Fu; (7 and 8) Salt marshes near Pei-t'ang; (9) On the road between Peking and Shan-hai-kuan; (10 and 13) Tower on Peking-Shan-hai-kuan road; (11) Stream, Peking—Shan-hai-kuan road; (12) A hollow road; (14) Buddhist nun's tomb near T'ung Chou; (15–19 and 26–31) Typical villages on the Chih-li plain; (20) The Tou Ho, on the Peking—Shan-hai-kuan road; (21) Village on the Pei-t'ang Ho; (22) Village on Lu-t'ai canal; (23) Eastern suburb of Fêng-jun Hsien; (24) Salt heaps at Han-ku on the Pei-t'ang Ho; (25) On the Pei Ho; (32) Blacksmith's shop; (33) Type of big house in village; (34) A wayside tea-house; (35 and 37) House in a village; (36) Fishermen's huts near Ch'in-wang-tao; (38 and 40) Inn yard; (39) A midday halt; (41–49) Temples on the Chih-li plain; (50–56 and 60–63) Typical villagers of Chih-li plain, in summer clothes; (57) A blind beggar; (58) Reservists of 2nd Division going up for training; (59) Boatman on the Pei-t'ang Ho; (64) A crop of Kao-liang (high millet); (65) Ploughing; (66) A crop of Hsiao-mi (small millet); (67) Loading; (68 and 69) Carrying; (70) Pulling heads off millet for threshing; (71) Threshing; (72–78) Animals; (79 and 81) Peking carts; (80 and 82) Big carts; (83) Four-horsed cart; (84) Two-man wheelbarrow; (85–88) Po-ch'uan

or cargo boats, on the Pei Ho and Ta-ch'ing Ho; (89-91) K'ua-tzŭ, or passenger boats, on the Pei Ho and Ta-ch'ing Ho; (92) Big sea-going junk at Pei-t'ang; (93) House-boat on Pei-t'ang Ho; (94) Sea-going fishing junks at Pei-t'ang; (95) Cargo boats on Pei-t'ang Ho; (96) Ts'ao-tzŭ (snake boat) on Pei-t'ang Ho; (97) Erh ts'ao-tzŭ (double snake boat) on Pei-t'ang Ho; (98 and 101) Salt boats on Lan Ho; (99 and 100) Ferry boats for carts; (102) Ferry over the San Ho near San-ho Hsien; (103) Ferry over Pei Ho at T'ung Chou; (104) Railway bridge over Pei-t'ang canal: (105) Wooden bridge over Lu-t'ai canal near Tientsin; (106 and 107) Bridges over the Ta-ch'ing Ho; (108) Stone bridge; (109) Lock at Lu-t'ai; (110) Wooden bridge near Tientsin; (111) Shan-hai-kuan city wall; (112) An Chou city wall; (113) Lan Chou city wall; (114) Guard house on Shan-hai-kuan city wall; (115) Peking, interior of Chinese city from Chang-yi Mên; (116) Peking, main street of Chinese city, looking south from Ch'ien Mên; (117) Peking, the Ch'ien Mên (gate between Chinese and Tartar cities); (118 and 119) Peking, interior of Tartar city from south wall; (120) Peking, south wall of Chinese city, looking west from the Yung-ting Mên; (191) Ch'in-wang-tao harbour; (122) Ch'in-wang-tao bluff from the pier; (123) View north from the sand-hills at north end of Ch'in-wang-tao bluff; (124) Sandhills at north end of Ch'in-wang-tao bluff; (125) View from hotel at Shan-hai-kuan; (126) View from outside the west suburb of Shan-hai-kuan.

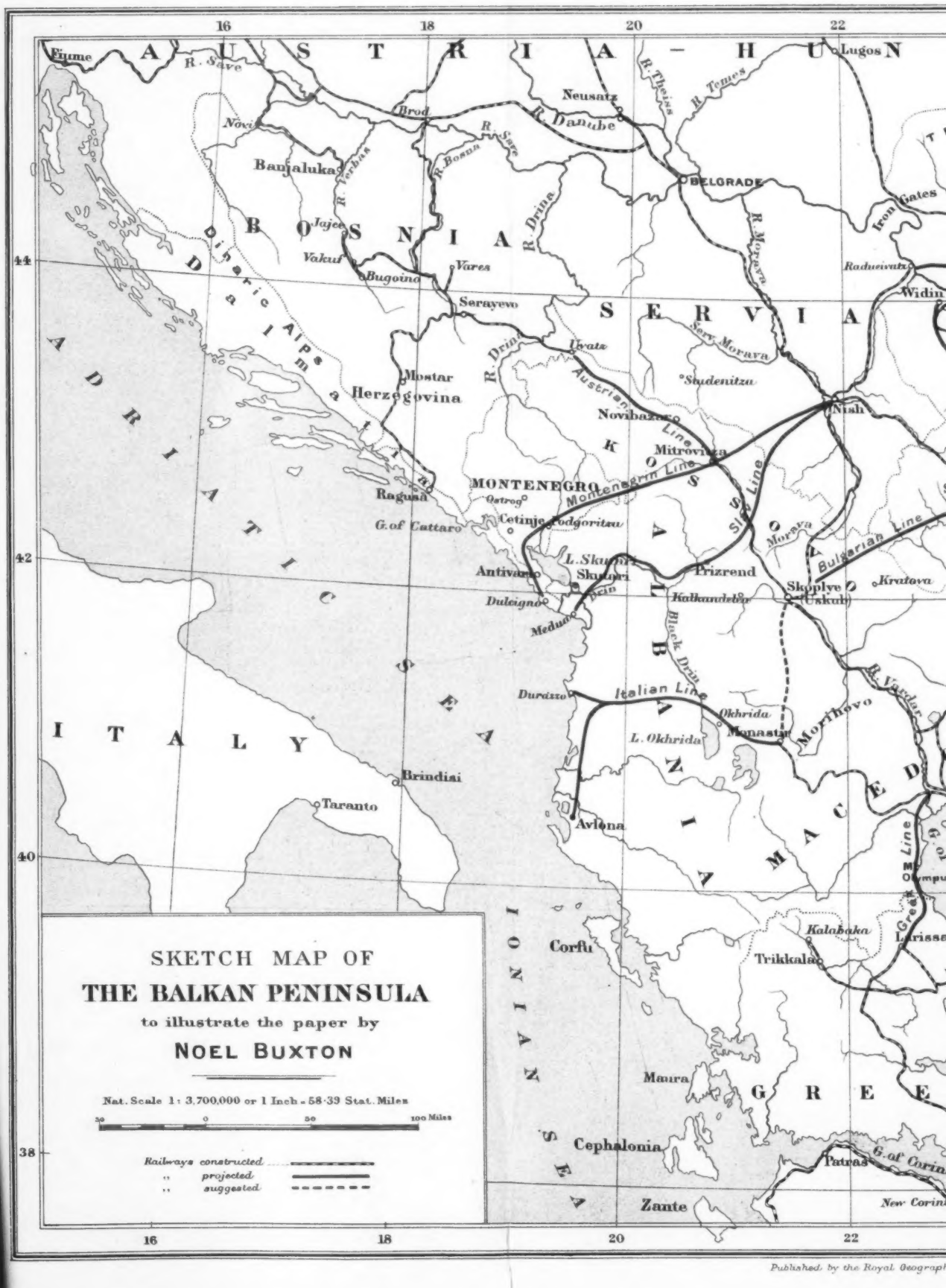
China. **Kirkhope.**

Sixty-five photographs of China, taken by Hugh Kirkhope, Esq., M.A. *Presented by Hugh Kirkhope, Esq., M.A.*

The first five are large views of the Ellis Kadoovie schools at Canton; the greater number of the remainder being views of Canton and its environs, Chefu, Wei-hai-wei, and Peking. They are placed in an album and carefully described. The titles are as follows:—

School at Sai-kuan (Canton):—(1) Entrance; (2) Beginners' class; (3) A reading lesson under an Anglo-Chinese master; (4) Group of pupils and master; (5) Group of masters and local secretary of the school. (6) Bridge opposite Shamien, Canton; (7) Gate, Canton; (8) A market-place, Canton; (9) Lo Pan Miu, Honan; (10) A court-yard; (11) One of the older streets, Canton; (12) Old dome-shaped roofs, outskirts of Canton; (13) House decorated for marriage; (14) On the way to Kun-yam Shan; (15) Street scene, Canton; (16 and 17) Dwellings on the creek; (18 and 19) The nine-storey pagoda, Canton; (20 and 21) Paddy-fields; (22 and 23) Beggars; (24) Hill tombs; (25) Terrace on river-side, Honan; (26) Old walled market town, at foot of White Cloud hills; (27) Temple on White Cloud hills; (28) Hill graves; (29) Entrance to old temple, Canton; (30) Roof of temple; (31) General view of temple; (32) A hill road in rain; (33) Scene from Pak-wen-Shan; (34) Temple steps; (35) Interior view of temple; (36) Temple gates; (37) Bridge near Ten Table island, Macao; (38) Temple on Kun-yam Shan; (39) Temple at Pun-tong; (40) A scene in Honam; (41) Very old temple gates, Canton; (42) Entrance to "City of the Dead," Canton; (43) Archery practice; (44) Irrigation in Fa-ti; (45) Temple buildings on Pak-wen Shan; (46) Looking towards Kun-yam Shan; (47) The Viceroy's chair, Canton; (48) Outer courtyard of house; (49) A Chinese scholar; (50) Street scene, Chifu; (51) Street theatrical performance, Wei-hai-wei; (52) Scene on the beach, Wei-hai-wei; (53) Small Hill-Joss, Wei-hai-wei; (54) Hatamên gate, Peking; (55-57) Hatamên Street, Peking; (58) Gate on north side of Peking; (59) View near Legation quarter, Peking; (60) One of the watch towers on the walls, Peking; (61) Funeral procession, Peking; (62) Imperial chair and retinue conveying Emperor's presents to Prince Fushimi; (63) Official's chair; (64) Tower on wall, Peking; (65) Part of the British Legation wall as it appeared after the siege.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.



SKETCH MAP OF

THE BALKAN PENINSULA

to illustrate the paper by

NOEL BUXTON

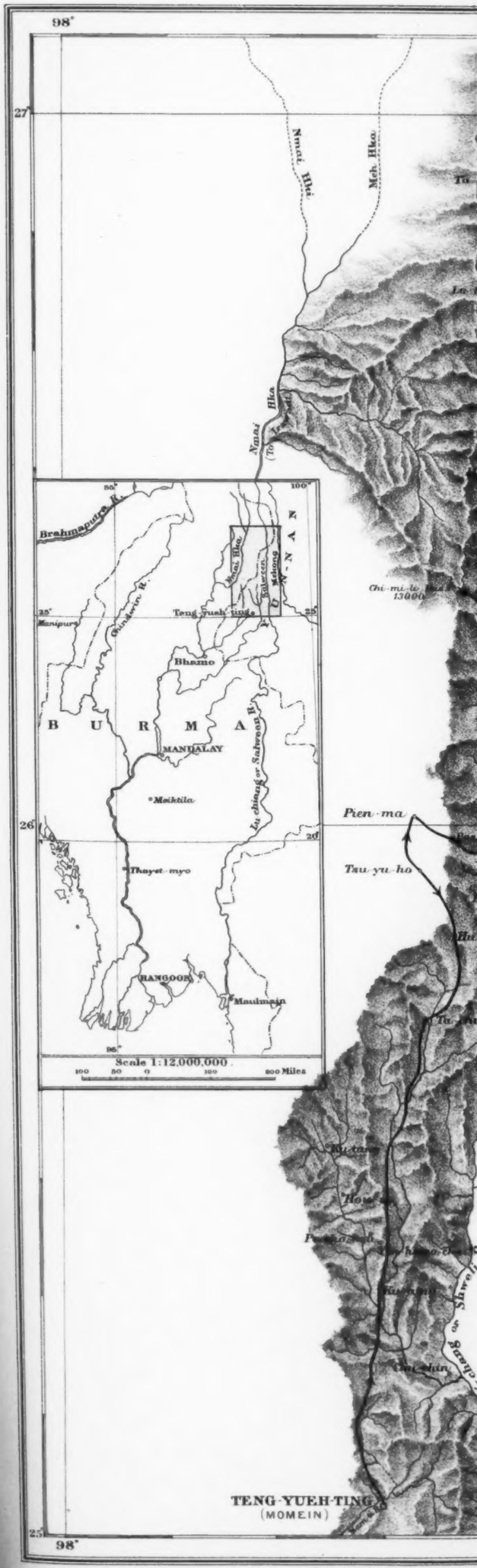
Nat. Scale 1: 3,700,000 or 1 Inch = 58·39 Stat. Miles

50 0 50 100 Miles

Railways constructed
,, projected
,, suggested

Published by the Royal Geograph

24
26
28
30
44
42
40
38
GARRY
Kronstadt
RUSSIA
Galatz
Braila
Mouths of the Danube
TRANSYLVANIAN ALPS
Ployeshti
Pitesti
RUMANIA
Walachia
Yalomitza
BUKAREST
R. Arjesh
Constanza
Kustenji
Craiova
R. Ol
R. Isker
Vidin
Kalafat
Giurgevo
Rustchuck
Karabbia
R. Danube
Nikopol
BLACK SEA
Plevna
BULGARIA
Shumla
VARNA
Vraitza
Tirnovo
Balkans
Trojan
Sofia
Burgas
Stara Zagora
(Eski Saghra)
Radomir
EAST RUMELIA
Rilo
Rilo Dagh
Mt. Musalla
Thirpan
R. Maritza
Philippopolis
Rhodope Mts.
R. Arda
ADRIANOPLE
R. Struma
R. Mesta
MACEDONIA
Drama
CONSTANTINOPLE
Bosphrus
Skutari
Serres
Kavala
R. Erkene
Sea of Marmara
Thasos
Dede Agach
Orfano
SALONIKA
Samothraki
Gallipoli
Brusa
Gulf of Salonika
Imbros
Lemnos
Dardanelles
ÆGEAN SEA
ASIA MINOR
Volo
Lesbos
(Mytilene)
Chalkis
Khio
SMYRNA
ATHENS
Corinth
Andros
Samos



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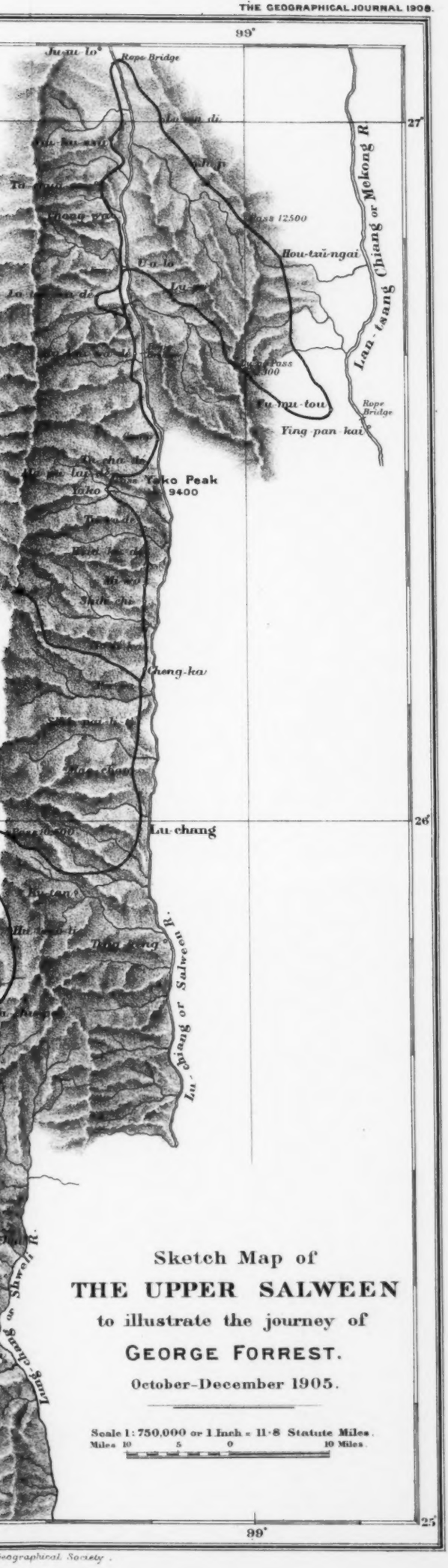

Sketch Map of
THE UPPER SALWEEN
to illustrate the journey of
GEORGE FORREST.
October–December 1905.

Scale 1: 750,000 or 1 Inch = 11·8 Statute Miles.
Miles 10 5 0 10 Miles.

146°30'
147°
147°30'
8°
8° 30'
9°
9° 30'
K A I S E R W I L H E L M S
L A N D
Fly R.
Tiveri R.
Lakekamu R.
Swamp
Rapids
and Lagoons
300
200
Mt Chapman
Round Hill
300
Mt Dickson
Mt Nelson
1195A
Mt Chamberlain
1122B
Mt Alexander
Bore Hopper
Maipa
Mt Kubor
Ioi
R. Biaru
Aitea
Tully Pk
Varjus Dome 4890
Elaia Pk
Navara Needle
3360
Mt Davidson
5600
Wedge H.
Meikeo
Gov. Stn.
Waimatura H.
Rapeka
Jesu Baibua
Eboa
Inawaiya
Babika
Inawabui
Biota
Yule I.
(Roro or Lolo)
Hall Sound
Ala-ula
334
Kairuku
(Gov. Sett.)
POKAU
OR
ARA
Pt Kapripata
Gubbins Pt
Orobi
Ala-ala 360
C. Suckling
RORO
KABADI
REDSCAR
BAY
Redscar Head
Varivari I.
Caution
Bay
MOTU
Haidana
Idlers Bay
Daugo
PORT MORESBY
Walter Bay
Pyramid Pt
Boodless Inlet
Mt Lilley
Mt Carmen Range
Mt Veriveri
Mt Frank Lawes
Mt Manoro
Mt Keith
Mt Mudurunumu
Lit. Mt Lawes
Mt Lawes
Flat Top
Saddleback
Iuma
Sadowa
Granville
Mt Warirata
Mt Gewaia
Mt Tabunumu
Mt Origori
Mt Maguli
Mt Bates
Mt Jukes
Mt Amodadi
Mt Mahonum
Mt Bride
Mt Douglas
Sugarloaf
Gap
Tupeselaia
R. Bailala
Haile
Mission
Aroa R.
Vanuapaka
Doura
Motoro
Valley
Kapuana
R. Two
R. Veipauri
Inaia
Mabadi
Malay's
Landing
Motapaile
Bikeni
(Skittle Rocks)
Morabi
Manumanu
R. Laloki
Naoro or Brown R.
Goldie
Swamp
Huhunamo
Iovabada
Gaire
Dumbiram Bluff
Ower's Corner
Mt Askwith
Mt Alexander
Mt Yule
Mt Obree
Mt Ajaau
MOHORO
Plain
Ononge
Kerema
Yodda R.
Yodda
(stores)
Hohodda
Aikora R.
The Sisters
Mt Stone Wig
Mt Diene
Mt Soue
Mt Kofaia
Sibu 5650
Emoiengalo 2890
R. Waliuma
R. Hubuni
R. Tumu
R. Tuna
R. Paimo
R. Etevi
R. Aopi
R. Mayuka
R. Ulisa
R. Love
R. Warria
R. Eia
R. Warupi
Old German House
Heavy Forest
Creek
Flat and
Mahon Village
Segesira Village
Bore Village
Mairota Vill.
Waitapa
Ononge
Olovia
Wharton Range
Mt Victoria
Mt Albert Edward
Mt Yule
Mt Obree
Mt Douglas
Mt Bride
Mt Mahonum
Mt Amodadi
Mt Jukes
Mt Bates
Mt Maguli
Mt Origori
Mt Tabunumu
Mt Gewaia
Mt Warirata
Mt Askwith
Mt Alexander
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R. Aopi
R. Mayuka
R. Ulisa
R. Love
R. Warria
R. Eia
R. Warupi
Old German House
Heavy Forest
Creek
Flat and
Mahon Village
Segesira Village
Bore Village
Mairota Vill.
Waitapa
Ononge
Olovia
Wharton Range
Mt Victoria
Mt Albert Edward

NEW GUINEA
Nat. Scale 1:15,000,000 or 1 Inch = 237 Stat. Miles.
DUTCH NEW GUINEA
BISMARCK ARCHIPELAGO
KAISER WILHELMS LAND
NEU POMMERN
BRITISH NEW GUINEA
GULF OF PAPUA
CORAL SEA
QUEENSLAND
Torres Strait
Cape York Peninsula
Continuation of Map to West
on scale of 1:1,500,000 or 1 Inch = 23·67 Stat. Miles
NAMAU
Purari R.
Orokolo
Mission
Barui R.
Pisarea R.
Aivei R.
Alele R.
Keremo
Keremo B.
Vailala R.
Matupe R.
Cupola
Freshwater B.
Wamai
Maviavi
Motumotu
Lese
Biaru R.
Wedge H.
C. Possession
Mambare or Duvira Bay
C. Ward Hunt
Douglas Hr.
Harper I.
Rocks
Robinson B.
Black Rks
Caution Pt.
Ambush Pt.
Mitre Rock
Dead Mangrove Pt.
Taututa Vill.
Evire Vill.
Gira R.
Mambare R.
Gadara Vill.
Kosi
(Round Cone)
Koiena Lakes
Saltwater Lagoon
Swampy flat country
Ope R.
Flat swampy country
KUMUSI TRIBE
Kumusi R.
Bapa
Bafure
Gona
Bakumbari Cr.
HOLNICOTE (GUNA BAY) BAY
Mangrove Pt.
Buna Bay
Buna
(Govt. Stn.)
C. Endaiadere
C. Sudest
Plains
Grass & Forest
R. Tambakaro
Mandova
Oro Bay
Port Harvey
Mt. Lamington
6520
Hydrographers Ranges
Divide
Papungi Villages
Mt. Monckton
9000
DYKE ACLAND BAY
Mt. de Vis
Musa River
Gudari Vill.
Mt. Obree
10246
8530
Koreke
Panton
Mt. Brown
7947
Oiwa R.
Mona R.
R. Adgeu
Domara R.
Babobere H.
Mt. Suckling
Mt. Yule
Mt. Victoria
Acland B.
D'Entrecasteaux Is.
Redscar Bay
Mt. Brown
Mt. Suckling
Clarence Is.
Hood Gulf
Astrolabe B.
Dampier Str.
Mambare R.
Kumusi Villages
300
Tera Vill.
Pan Vill.
Purukoda Vill.
Taututa Vill.
Dead Mangrove Pt.
Ope Villages
Village
Waututa Pt.
Mangrove Pt.
Ausemba Villages
Mt. Urubuli Heute
Mt. Nisbet
Source of Mani R.
Mt. Shillinglaw
Geigere
Turners Hill
Mt. Stevens
Deakin
Bates
Monckton Pass
Monckton Spur
Tagisa Vill.
Mona R.
Oiwa R.
R. Adgeu
Domara R.
Babobere H.
Mt. Suckling

PART OF
BRITISH NEW GUINEA

From Explorations and Route Surveys by

W. M. STRONG, M.A., M.D.
C. A. W. MONCKTON, R. M. 1904-7.
AND
CAPTN F. R. BARTON, C. M. G.

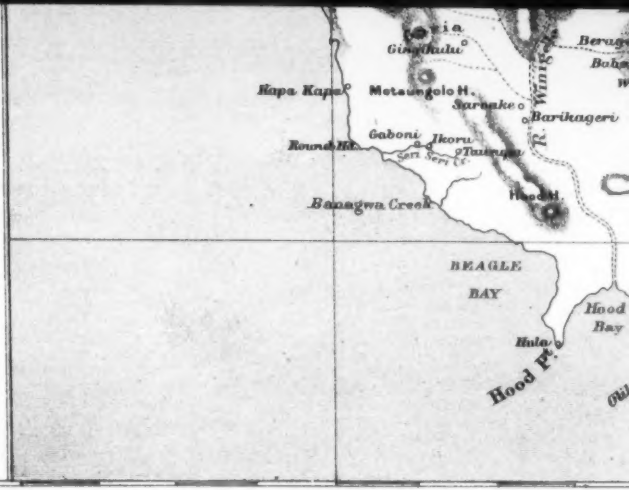
With additional information from the previous surveys of

SIR WILLIAM MACGREGOR, K.C.M.G.

Nat. Scale 1: 750,000 or 1 Inch = 11·84 Stat. Miles

10 5 0 10 20 30

Heights in feet.



10°

146°30′ 147° 147°30′

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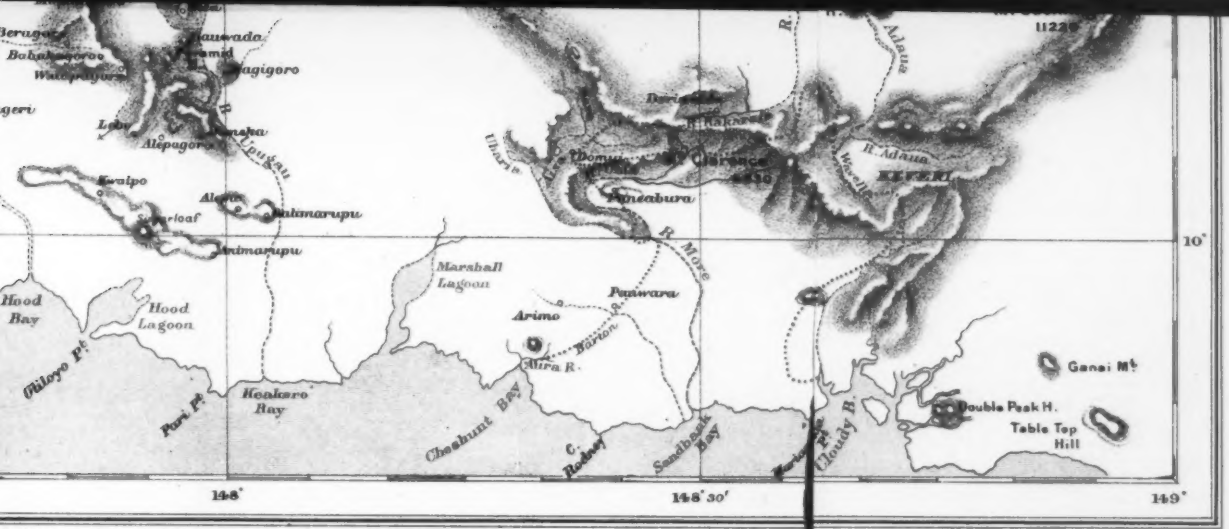
Hood Bay
Hood Lagoon
Marshall Lagoon
Arimo
Papiwara
Mt Lawes
Kaneabura
Ubaria
Alira R.
Ohiloyo Pt
Port Pt
Heakaro Bay
Cheshunt Bay
C. Robert
Sandbank Bay
Double Peak H.
Table Top Hill
Ganai Mt
R. Adana
10°
148°
148° 30'
149°

Society.